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TO: CalRecycle
Submitted to SB 54 Regulations Informal Rulemaking Comment Period form

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SUBJECT: SB 54 Regulations Informal Rulemaking Comment Period, focus on "chemical recycling"

DATE: June 3, 2025

The Global Alliance for Incinerator Alternatives (GAIA) is a global network of grassroots groups working to catalyze a global shift towards environmental justice by strengthening grassroots social movements that advance solutions to waste and pollution. We envision a just, zero waste world built on respect for ecological limits and community rights, where people are free from the burden of toxic pollution, and resources are sustainably conserved, not burned or dumped.

For over two decades, GAIA has engaged in regulatory processes led by CIWMB and CalRecycle related to gasification, pyrolysis, and similar technologies. Due to GAIA's effective global network, we have shared research and operational data from around the world surfacing major challenges with these technologies, including evidence of facilities producing hazardous waste and air pollution, high capital and operating costs, technical and operational feasibility, and conflicts with California' s zero waste and environmental justice goals. During this period, many communities have also brought forward concerns about proposed facilities.

We appreciate the opportunity to submit comments on the SB54 new draft regulations, following our in-person participation at the 27 May informal workshop. Recognizing the significant amount of work CalRecycle has put into these draft regulations, it is of the utmost importance that they both

comply with the letter of the SB54 law, and its intent. In this letter we focus on a number of new critical problems and weaknesses in the draft regulations regarding gasification, pyrolysis, and other so-called "chemical recycling" or "advanced recycling" technologies.

Proposed textual changes *(**<u>additions</u>** and ~~deletions~~)*

Section 18980.3.5. Disposal of Covered Material

<u>(e) Pyrolysis and other forms of disposal, as defined in subdivision (b) of section 40192 of the Public Resources Code.</u>

Section 18980.4.1. End Market Identification

(d) A PRO or Independent Producer shall not include in its plan as a responsible end market a technology, other than a mechanical recycling technology in use within the State as of the effective date of the Act~~, if the facilities employing it produce significant amounts of hazardous waste as defined in paragraph (1)~~.

~~(1) For purposes of paragraph 5 of subdivision (aa) of section 42041 of the Public Resources Code, "significant amounts of hazardous waste" means hazardous waste as defined in Title 40 of the Code of Federal Regulations Section 261.3 that presents an imminent and substantial risk of harm to public health, or to the contamination of the environment.~~

~~(A) The existence of a "substantial" risk of harm to public health, or to the contamination of the environment, shall be evaluated in comparison to the risks posed by mechanical recycling technologies in use within the State as of the effective date of the Act. Such mechanical recycling technologies do not produce significant amounts of hazardous waste for the purposes of the Act and this chapter.~~

~~(B) The production of hazardous waste that is handled and disposed of in substantial compliance with an applicable permit does not present a substantial risk of harm to public health or to contamination of the environment, for purposes of the Act and this chapter.~~

~~(2) A facility's use of a technology that is not a mechanical recycling technology in use within the State as of the effective date of the Act shall not be considered recycling unless the facility operates in a manner consistent with ISO 59014:2024.~~

~~(3) A facility using the technology shall comply with all requirements applicable to responsible end markets as established in this Article.~~

~~(4) Before being included as a responsible end market in the PRO or Independent Producer plan, any facility requesting its technology to be eligible must provide to the PRO or Independent Producer:~~

~~*(A) A description of the technology and how that technology is consistent with the definition of recycling pursuant to subdivision (aa) of section 42041 of the Public Resources Code.*~~

~~*(B) A description of the covered material to be processed and the yield of the recovered material that meets the quality standards necessary to be used for the creation of new or reconstituted products.*~~

~~*(C) The weight (in kg) of material processed per calendar month for the last twelve months.*~~

~~*(D) The weight (in kg) of hazardous waste as that term is defined in Title 40 of the code of Federal Regulations Section 261.3, generated per calendar month for the last twelve months.*~~

~~*(E) The weight (in kg) of "acute hazardous waste" as that term is defined in Title 40 of the Code of Federal Regulations Section 261.11(a)(2), generated per calendar month for the last twelve months.*~~

~~*(5) In its plan, a PRO or Independent Producer shall justify its conclusion that use of a particular technology does not produce significant amounts of hazardous waste.*~~

~~*(6) Upon inclusion in an approved PRO or Independent Producer plan as a responsible end market under this subdivision, a facility shall continue to report annually the data in paragraph (4) of this subdivision to the PRO or Independent Producer.*~~

A categorical prohibition on so-called "chemical recycling" would best uphold the statute

First and foremost, CalRecycle must set a categorical prohibition on so-called "chemical recycling" technologies (or toxic and climate-intensive plastic breakdown) including gasification, pyrolysis, solvolysis, depolymerization, solvent-based purification, and other related technologies.

A prohibition would uphold the following statutory language in section 42041.aa(5) defining recycling:

> *The department's regulations shall encourage recycling that minimizes generation of hazardous waste, generation of greenhouse gases, environmental impacts, environmental justice impacts, and public health impacts. [emphasis added]*
>
> *The regulations shall include criteria to exclude plastic recycling technologies that produce significant amounts of hazardous waste.*

Evidence shows that such operations have actually deepened environmental injustice, including cancer risk and harming the climate. Multiple facilities that have operated, even briefly, have in fact **generated significant amounts of hazardous waste**, as NRDC found in March 2025:

> *…the pyrolysis process creates large amounts of hazardous waste. EPA reporting data shows that between 2021 and 2024, just three pyrolysis facilities that were processing plastic waste generated more than 2 million pounds of hazardous waste and shipped it off-site for disposal.*

> *If all 26 of the pyrolysis facilities that are currently proposed or under construction are actually built and put into operation, this could mean between 624,000 and 10.8 million additional pounds of hazardous waste generated in, transported through, and disposed of in communities across the country.*[1]

ProPublica and *The Guardian* reported that EPA estimated, conservatively, that air pollution from making fuels out of plastic waste could lead to cancer in 1 out of 4 people exposed to it over a lifetime.[2] The article quotes Linda Birnbaum, former head of the National Institute of Environmental Health Sciences as saying, "That kind of risk is obscene." While plastic to fuel is not allowed under SB54, there is no evidence that plastic to plastic using the same technologies will have different hazardous contaminants.

One such facility (Braven Environmental in North Carolina) is registered with the EPA as a large quantity generator that generates at least 1,000 kilograms per month of hazardous waste.[3] Its permit application lists risks from pyrolysis oil including genetic defects and cancer, organ and fertility damage, and dangers to unborn children, in addition to being "very toxic to aquatic life," "extremely flammable," and having "long lasting effects."[4]

These technologies are also **major emitters of greenhouse gases**. The National Renewable Energy Laboratory found that "chemical recycling" produces an order of magnitude more greenhouse gas emissions than mechanical recycling, and more emissions per ton than primary (virgin) plastic.[5] This accords with GAIA's own analysis, which found that the much-hyped Agilyx facility emitted more than 3 pounds of CO_2 for every pound of recycled styrene that it produced. Increased "chemical recycling" of waste plastic would therefore increase California's overall greenhouse gas emissions and conflict with existing California climate policy. GAIA notes with concern that the current version of the regulations do not contain a single reference to greenhouse gases, nor does ISO standard 59014:2024 included as an end market criterion in section 18980.4.1.(d).2.

Given the existing evidence of significant production of hazardous waste and greenhouse gas emissions, and the statutory requirement to encourage recycling technologies that minimize the generation of both hazardous waste and greenhouse gas, the most statute-aligned and clear-to-implement regulatory approach would be to prohibit such technologies on account of their generation of hazardous waste and greenhouse gases.

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[1] Renee Sharp, "Chemical Recycling" Is a Toxic Trap, NRDC, https://www.nrdc.org/press-releases/chemical-recycling-plastics-really-toxic-trap

[2] Sharon Lerner, This "Climate-Friendly" Fuel Comes With an Astronomical Cancer Risk, *ProPublica,* Feb. 23, 2023 http://propublica.org/article/chevron-pascagoula-pollution-future-cancer-risk

[3] Schuyler Mitchell, Garbage In, Toxics Out: They Promised "Advanced Recycling" for Plastics and Delivered Toxic Waste, The Intercept, Sept. 28, 2023. http://theintercept.com/2023/09/28/braven-plastic-recycling-toxic-waste/

[4] Ibid.

[5] Uekert, Taylor, Avantika Singh, Jason S. DesVeaux, Tapajyoti Ghosh, Arpit Bhatt, Geetanjali Yadav, Shaik Afzal et al. "Technical, economic, and environmental comparison of closed-loop recycling technologies for common plastics." *ACS Sustainable Chemistry & Engineering* 11, no. 3 (2023): 965-978.

The regulations must clearly delineate what is considered disposal, which can be partially achieved by returning language that was deleted from the previous version of the regulations, and naming pyrolysis (see above).

The draft regulations technology review and approval process removes peer review safeguards, gives producers an outsized role, lacks transparency, and lacks safeguards against increased emissions during the approval window

The draft regulations surrender the environmental evaluation process to industry. The Producer Responsibility Organization (PRO) is granted authority to approve so-called "chemical recycling" technologies, with CalRecycle merely providing review. Given that several industry organizations have been calling for these technologies to be allowed in recent SB54 Advisory Board meetings, it is irresponsible to allow the industry itself to determine whether technologies are considered recycling.

The proposed role of producers in the review process for recycling technologies constitutes a conflict of interest, given producers' direct material incentive to support technologies that don't threaten their current linear packaging business models, rather than acknowledging the real health and and environmental harms generated by such technologies, and assuming the transition towards reuse. The proposed flawed review process would open a new loophole to approve gasification, pyrolysis, solvolysis, and other forms of toxic and climate-harming plastic breakdown.

The proposed five-year facility approval window in §18980.4.1(d)(4)(D), would allow for a facility to scale up production and hazardous waste generation over five years with no accountability or review.

The draft regulations violate the letter and intent of SB54 by gutting the provisions on "Significant amounts of hazardous waste"

- The draft regulations define away "hazardous waste." If an entity is in "substantial compliance" with permits to produce and dispose of hazardous waste, §18980.4.1(B) concludes that the entity is not producing a "significant quantity of hazardous waste." "Substantial compliance" is a vague and unenforceable criteria, and this approach relies on a circular argument that allows technologies to qualify as recycling regardless of the type and quantity of hazardous waste they produce.
- By relying on permitting to define hazardous waste, these draft regulations make the same technology subject to compliance with numerous different jurisdictional requirements, including those outside of California when dealing with end markets. Given that permitting tends to be less stringent outside of California, this provision could exacerbate existing, and create new, waste colonialism abuses.
- The draft regulations only reference the federal definition of hazardous waste, which is much narrower and less protective than the California definition, opening the door to the generation of hazardous wastes that California would consider hazardous, but the federal government does not. California standards should apply to California regulations.

- This draft of the regulations only requires data about weight of material processed per calendar year for the last twelve months, weight of hazardous wastes in that period, and weight of acute hazardous wastes for that period, shifting the emphasis to management of hazardous waste rather than preventing the generation of hazardous waste.
- Data standards are missing in this draft of the regulations, which were included in the earlier regulations. *Data best practices would be critical for any and all data collected for all end markets:*
    - Company submissions of information/evidence should be required to be accurate
    - Data must be sourced from actual operating facility data not laboratory or modeled data, and must adhere to best practice such as continuous monitoring during other than normal operation conditions (OTNOC) including facility startup and shutoff;
    - Data must be presented in raw form, not as an LCA or after offsets
    - Requirements for pre-sorting/feedstock cleanup must be included
    - GHG emissions data must be provided, and evaluated in context of CA's climate goals
    - Full mass balance must be provided
    - Full chemical characterization of all inputs (including process chemicals and catalysts) and outputs (liquid, solid, gaseous) must be provided
    - Energy requirements must be clearly disclosed
    - Financial disclosures of cost implications

ISO standard 59014:2024 is not an adequate criterion for responsible end markets, and particularly not in isolation

We understand that CalRecycle's intention was to propose ISO standard 59014:2024 as an additional criterion to define responsible recycling end markets, and not as an alternative criterion to others listed in sections 18980.4.1.(d).

However, the paragraph 18980.4.1.(d).2. appears to be in isolation, which would open a loophole for "chemical recycling" and empty recycling of its meaning. Indeed, ISO standard 59014:2024 does not constitute a robust criterion in isolation, for several reasons.

ISO 59014 is not specific to recycling, but is a general document on material recovery. It is not intended, nor does it serve the function, of an international standard for what constitutes recycling. It does not define recycling, nor does it include a single environmental or efficiency benchmark to distinguish legitimate recycling operations from fraudulent, toxic, and climate-harming operations.

Instead, the ISO proposes soft, optional, qualitative guidelines for material recovery operators to standardize their operations from a labor and circular economy aspect (e.g. recommendations on types of data to collect, and on types of policies to include) and is a purely non-binding standard. ISO adherence is self-declared and lacks enforcement by the state.

This ISO standard also sets a bad precedent by promoting the use of a very narrow LCA, which ignores issues around toxics and human health concerns and environmental pollution, among other elements.

Finally, the ISO is not an international authority on waste management and recycling, but the Basel Convention is. The Basel Convention has explicitly rejected the inclusion of chemical recycling in its plastic waste management guidelines because these technologies could not be shown to be environmentally sound.

Chemical recycling would significantly inflate SB 54 implementation costs

Given the scrutiny of implementation costs for SB 54, a prohibition against so-called "chemical recycling" would prevent the cost to the public of incredibly expensive facilities with low performance and high closure rates. A 2013 U.S. industry trade journal estimated that capital costs for pyrolysis and gasification are comparable or slightly higher than capital costs for mass burn incinerators, which are the most expensive type of waste management facility.[6]

Pyrolysis–the primary form of current and proposed so-called "chemical recycling" operations–alone is incredibly expensive: a May 2025 industry report found chemical recycling using pyrolysis will require $453 billion to become competitive in the European Union alone, and assumes these price premiums would be paid by "customers, regulatory mechanisms, and margin investment by the value chain."[7] This report should be viewed with caution as it includes highly optimistic assumptions about the willingness of industry to pay a premium for sourcing materials, considering that European recycled content is not competitive in the global market, and Europe is increasingly importing lower-cost recyclate.

Recent financial failures for gasification technologies are illustrative:

- Enerkem gasification company in Canada declared bankruptcy in May 2025, the flagship facility in Edmonton closed in 2024.[8] According to *La Presse* newspaper, the province of Quebec invested $84 million (Canadian) of public funds into Enerkem, and "according to court filings, Enerkem faces claims of nearly $373 million, including unsecured debt, for assets worth just $31.5 million."[9]
- Fulcrum BioFuels ("sustainable aviation fuel" from MSW) launched its Sierra plant outside Reno, Nevada, in 2022, with the goal of using gasification of municipal solid waste to produce "sustainable aviation fuel." Despite raising more than $1 billion, the plant closed in

[6] https://www.no-burn.org/wp-content/uploads/2021/03/Waste-Gasification-and-Pyrolysis-high-risk-low-yield-processes-march-2017.pdf
[7] https://www.plasticsnews.com/news/chemical-recycling-will-require-453b-become-competitive
[8] https://www.insolvencies.deloitte.ca/en-ca/pages/Enerkem-Inc.aspx?searchpage=Search-Insolvencies.aspx&Source=Enerkem.aspx
[9] Hugo Joncas, 100 million lost for the public and workers: Enerkem on the verge of bankruptcy , *La Presse,* May 17, 2025 https://www.lapresse.ca/affaires/entreprises/2025-05-17/100-millions-perdus-pour-le-public-et-les-travailleurs/enerkem-au-bord-de-la-faillite.php (in your browser, change the language to English to read this article in English)

2024 after a series of technical challenges. Fulcrum filed bankruptcy and the land and assets have been sold. Multiple articles describe Fulcrum's waste gasification technology challenges and as of October 2024, Fulcrum had a net worth of over negative $400 million.[10]

Further examples of individual facility costs are covered in the report Waste Gasification & Pyrolysis: High Risk, Low Yield Processes for Waste Management[11]

- Air Products, a US company, lost over $900 million on gasification facilities in the UK.
- Thermoselect, in partnership with one of Germany' s largest energy companies, lost $500 million during 5 years of operating a gasification operation, before shutting the facility down due to extensive operations problems.
- At least six UK companies went bankrupt trying to build gasification for waste.

In conclusion, we appreciate the opportunity to outline our concerns with the new SB54 draft regulations, and look forward to continuing to engage on these and other issues as this process moves forward. As Director Heller noted in her introductory comments at the May 27 - SB54 Regulations Informal Rulemaking Workshop, the idea is not to start from scratch with these regulations, but to build on what was already developed. SB54 as well as earlier draft regulations go much further to protect public health, the environment, and the climate than the current draft regulations.

It is essential that all of us–the State of California, community, non profits, PROs, and industry–are focused on the true intent of SB54: To address the overwhelming amount of plastic packaging and its connected health, environmental, and climate impacts. California has been the climate leader in the United States, and this role is especially important right now. It is more important than ever that California prevent industry polluting our communities, air, water, land, and climate. We're looking to you for that crucial leadership with SB54.

[10] Jacob Wallace, Fulcrum BioEnergy's Nevada plant sued for more than $2M in missed payments to contractors, *WasteDive,* Aug. 26, 2024, https://www.wastedive.com/news/fulcrum-bioenergy-sued-by-contractors-sierra-biofuels-payments/725256/; Jacob Wallace, WM buys Fulcrum BioEnergy site in Nevada via bankruptcy process, *WasteDive,* Dec. 12, 2024, https://www.wastedive.com/news/fulcrum-bankruptcy-auction-assets-sold-wm-abengoa/735368/

[11] https://www.no-burn.org/wp-content/uploads/2021/03/Waste-Gasification-and-Pyrolysis-high-risk-low-yield-processes-march-2017.pdf