

GARY ADVOCATES *for* RESPONSIBLE DEVELOPMENT (GARD)

Why Fulcrum Bioenergy is A Bad Deal for Gary

Fulcrum Bioenergy claims it will build a plant in Gary that will turn landfill waste into “hundreds of millions of gallons” of aviation fuel annually. They claim their process – gasification – will produce “net zero carbon jet fuels,” meaning fuels that will not add to climate warming when they are burned.

Sound Too Good to be True? It Is.

Because Gary is an environmental justice community already overburdened by air, land, and water pollution, ***Gary Advocates for Responsible Development*** conducted a review of publicly available literature to evaluate the process Fulcrum Bioenergy proposes and the claims it makes.

This report concludes that plants like the one Fulcrum proposes have a long record of poor performance, are bad for the environment, and create toxic chemical hazards.

Learn more in the following chapters:

Chapter 1: Seven Reasons Why a Fulcrum Plant is a
Bad Deal for Gary

Chapter 2: What Experts & Scientists Say About Gasification

Chapter 3: Toxic Chemicals and the Gasification Process

Chapter 4: Who Does So-Called “Advanced Recycling” Benefit?

Don't Buy the Hype. Check It Out for Yourself!

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Chapter One

Seven Reasons Why Fulcrum is a Bad Deal for Gary

1. The Technology Has Failed Everywhere

Companies have been attempting to use gasification to reduce municipal waste streams since the 1970s, but no company in the world has produced fuel from waste on a commercial scale, let alone fuel that meets strict aviation standards.

Though many pilot programs have been attempted, most have failed, and in many cases the collected waste ended up being diverted back into local landfills or burned in incinerators or cement kilns.

2. Fulcrum Has No Track Record of Success

Fulcrum's claim that it has "developed and is operating a proprietary, patented, and proven process for turning waste into net zero carbon transportation fuels" is misleading.

- Fulcrum's only other facility, the Sierra Biofuels Plant, only started operations in May 2022 and has not yet produced any fuel. Neither the Gary plant nor any other plants mentioned on Fulcrum's website have been built.

- According to the Civil Aviation Organization, only eight alternative aviation fuel production routes are currently permitted, and gasification of municipal or solid waste is not on the list. Furthermore, gasification using mixed municipal solid waste (MSW) has been tried in Europe and Australia and has a long history of failure.

3. Gasification Pollutes

Fulcrum estimates that 30% of the waste it will process will be plastic. Most plastics contain numerous toxic chemical additives. Many of these additives have serious health consequence and are linked to increased risk of cancers, fertility problems and developmental problems in children.

These additives don't disappear during the gasification process. Mixed inputs of plastic waste have been demonstrated to generate toxic substances in char and emissions of carcinogens such as polyaromatic hydrocarbons (PAHs) and dioxins

The more thoroughly the gasification plant "cleans" or "purifies" the fuels, the more hazardous waste will be released into the environment or need to be hauled off to a waste dump, incinerator, or cement kiln. (Please see Chapter 3

Chapter One

Seven Reasons Why Fulcrum is a Bad Deal for Gary

Toxic Chemicals and the Gasification Process for more detail about the chemicals and health effects from the waste-to-fuel process).

4. More Waste Will Come Into Gary Communities

It takes enormous amounts of garbage to produce even a small amount of fuel. Fulcrum estimates that 100 to 120 truckloads of feedstock will travel to Gary from Chicago or Indiana every day.

These trucks will make 200-240 round trips up Cline Ave from I-94 to Buffington Harbor going through Gary the entire way, emitting dangerous greenhouse gases and particulate matter in communities that already suffer from high rates of asthma and other respiratory diseases.

5. There is No Such Thing as “Net Zero Carbon Jet Fuel”

Fulcrum claims the fuel it will produce will be “net zero carbon” but provides no data to back up this claim. It does claim that by removing waste from landfills they will reduce the methane gas – a serious greenhouse gas—that would have otherwise been emitted from those landfills.

But using organic waste to produce fuels by gasification simply transforms the carbon in the waste into carbon dioxide (CO₂) emissions when the fuel is burned, and CO₂ remains in the atmosphere far, far longer than methane does.

Fulcrum also never talks about the enormous amounts of energy required at every step in its process. It will burn traditional fossil fuels

- To transport the waste to its site
- To operate the gasification process; to clean the process outputs
- To convert them into fuel; and
- To transport hazardous wastes produced by the process off-site for disposal.

The reality is that Fulcrum will use more fossil fuel-based energy to produce their fuel than their fuels can ever offset.

To top it off, when the fuel (if it is actually ever created) is combusted in a jet engine, it will release into the atmosphere the same amount of carbon dioxide that would have been emitted if the plastic had been incinerated directly.

Chapter One

Seven Reasons Why Fulcrum is a Bad Deal for Gary

6. It's a Bad Investment

No company, anywhere in the world, has produced an ounce of aviation grade fuel using the process Fulcrum proposes. And gasification projects in both Europe and Australia have failed miserably due to the challenges in creating fuel from mixed waste streams.

Many experts believe that the costs of sorting, cleaning and transporting waste from landfills plus the extremely high energy costs required to produce fuel using gasification makes the whole project economically unfeasible.

Moreover, the fuels created are of a low standard because they have a lot of contamination. Filtering and cleaning up this contamination costs a lot of money and makes a lot of hazardous waste, which make these fuels uncompetitive with regular fossil fuels most of the time.

The reality is that no one even knows if these kinds of fuels are the best solution to power airlines.

Indiana has awarded Fulcrum Centerpoint \$500 million in tax exempt bonds for something that doesn't work now, may never work in the future, and may not even provide solution to the problems it claims to address.

7. Beware of the Hype

Plastic producers and the fossil fuel industry have a problem. Plastic is piling up all over the world in rivers and oceans, quickly filling landfills, and clogging the alley behind your house.

But they still want to produce more. Their financial plans call for doubling and tripling the amount of plastic they produce over the next 20 years in order to offset expected declines in gasoline, natural gas and oil sales.

To buy time, the companies that produce and sell plastic products are spending millions of dollars to capture taxpayer dollars and promote plastic recycling schemes like Fulcrum's that do not achieve what they claim.

In Fulcrum's case, when, as is likely, it can't produce aviation grade fuel, it will re-purpose its operation to produce a less high quality fuel or convert to a more typical type of incinerator.

In either case, truckload after truckload of waste will continue to come to Gary. Taxpayer money will have been wasted; and Fulcrum – or its successor -- will own valuable Gary lakefront property.

Chapter Two

What Experts & Scientists Say About Gasification

The process Fulcrum proposes to use, “gasification,” heats waste to produce “syngas” (synthetic gas) which is then further refined. Both gasification and a similar process, pyrolysis¹, are often referred to as “advanced recycling” or “chemical recycling.” Here’s what experts say about these processes.

It Doesn't Work

“A number of (gasification) plants were built in Europe and a number of efforts were done to successfully scale up the technology. However, it didn't work anywhere unless you had a very homogenous input of fuel to the reactors.

Waste is not a homogenous fuel. It has so far turned out to be too heterogenous to be able to treat in a gasification or pyrolysis process, irrespective of how you pre-treat the waste. It is absolutely not applicable for mixed MSW with today's technology.

Another very negative factor is that the energy balance very often has turned out to be negative.

It would, from an environmental point of view, be an excellent method if it worked, with low emissions and with a very small and environmentally safe residue, but unfortunately the

situation today and the experiences are the same today as almost 40 years ago, even if there have been and still are efforts to introduce gasification and pyrolysis on the market.”

Mr. Hakan Rylander, former President of International Solid Waste Association (ISWA) and the current CEO of the SYSAV Company Group. ([Global WTERT \(Waste to Energy Research and Technology Council\)](#))

“Nor has pyrolysis proven capable of transforming unsorted garbage into high-quality fuel and clean plastic resin...the value of what you're making is so low.”

Susannah Scott, chemistry professor at the University of California, Santa Barbara [The Recycling Myth](#), Reuters, July 29, 2021

“The idea of recycling plastic trash by cracking it is neither new nor revolutionary. It has just never worked before....In the past, such plants always

Chapter Two

What Experts & Scientists Say About Gasification

ran into problems when in continuous operation....I don't see how these issues could suddenly be resolved.”

[When the trash contains too many different materials or when it is too dirty] “the quality of the product is lowered, and the whole process becomes economically unviable.”
Roman Maletz, researcher, Institute of Waste Management and Circular Economy at the Technical University in Dresden [Do Fuels from Plastic Make Eco-Sense](#), *Deutsche Welle*, May 22, 2020)

It Pollutes

“The mixed waste stream will include plastics, timber, textiles (of which 60% are plastic), paper and cardboard.

The plastics may be from electronics, textiles (furniture/clothes/carpet) and packaging that contain brominated flame retardants (PBDE), PFAS (including PFOA and PFOS), SCCPs (Short chain chlorinated paraffins), and HBCD (hexabromocyclododecane) all of which are Persistent Organic Pollutants (POPs)¹ and can create additional toxic emissions, such as brominated and chlorinated dioxins, in the emissions and waste from the gasification processes... (PAHs) are commonly formed in

gasification plants and can be found in emissions.

They also form heavy tars in the system among the hydrocarbon 'heavy ends' in the cracker but also before that in the gasification system. There is high potential for hazardous emissions from this process.”

[Plastic Waste Management Hazards](#), *Professor Hideshige Tadaka, geochemist and professor at the Tokyo University of Agriculture and Technology & Lee Bell, Mercury and POPs Policy Advisor, International Pollution Elimination Network (IPEN)*

“There is low transparency on the levels of toxicity of all chemical-recycling technologies (such as early-stage solvent-based processes), but studies of pyrolysis and gasification show they produce toxic substances.

First, they do not filter out chemical additives and contaminants often found in plastic, such as BPA (bisphenol A), cadmium, benzene, brominated compounds, phthalates, lead, tin, antimony and volatile organic compounds. Second, the high-intensive processes themselves produce additional toxic compounds, such as

Chapter Two

What Experts & Scientists Say About Gasification

toluene, formaldehyde, vinyl chloride, hydrogen cyanide, PBDEs (Polybrominated diphenyl ethers), PAHs (Polycyclic aromatic hydrocarbons) and tars.”

[Hot Tickets and Hollow Promises: Investor Briefing](#). *Changing Markets Foundation*, 2021

It's a Bad Investment

“Investors should avoid being drawn in by the hype surrounding chemical recycling and should steward those they invest in away from reliance on this technology.

Although there may be a niche role for depolymerization in the long term, most technologies in the ‘chemical recycling’ arena are exposed to a number of risks and are unlikely to bring returns in the short term.”

[Hot Tickets and Hollow Promises: Investor Briefing](#). *Changing Markets Foundation*, 2021

“Many of the announced projects for chemical recycling facilities that I’ve written about over the past five years are, at this point, dead in the water. Some have been limping along for two decades, still unable to take in any significant amount of plastic waste to

produce commercially viable amounts of fuel, chemicals, or new plastic.

Yet, new announcements for chemical recycling facilities pop up in my inbox like dandelions on a spring lawn, announcing large investments and making even grander promises of helping solve the plastic waste crisis,” [Chemical Recycling is No Silver Bullet for Eliminating Plastic Waste](#), Clare Goldsberry, *Plastics Today*, February 13, 2021

It Won't Be Properly Regulated

“Policymakers in 18 states have already enacted legislation that encourages advanced recycling, and even more are considering taking similar action.

Most of these laws reclassify advanced recycling facilities as manufacturing plants, rather than solid waste facilities. Environmental groups are crying foul because that means chemical recyclers can receive government financial incentives and qualify for looser regulations.

And currently, industry groups are asking the Environmental Protection Agency to exempt pyrolysis and gasification units—two processes used for chemically recycling plastic—from stringent Clean Air Act regulations.”

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Chapter Two

What Experts & Scientists Say About Gasification

[State Laws Incentivize Chemical Recycling, but Environmental Advocates are Critical](#), *Chemical and Engineering News*, May 18, 2022

Claims of “Net Zero Carbon” and a “Tested, Certified and Approved Product” are Falsehoods

"If you break waste apart at a molecular level, you need a lot of energy, so the CO2 savings are quite low." Henning Wilts, Director of the Circular Economy Division at Wuppertal Institute for Climate, Environment and Energy [Is Jet Fuel From Waste Finally Ready for Takeoff](#), *WasteDive*, March 23, 2022

"... an energy consuming process: more energy has to be put in to treat the waste than can actually be recovered. It can never be sustainable." Andrew N. Rollinson, [Why Pyrolysis and Plastics to Fuels is Not a Solution to the Plastics Problem](#), *Lowimpact.org* December 2018.

"Though the Standard (Practice for Evaluation of New Aviation Turbine Fuels and Fuel Additives) specifies that there must be reports of testing, albeit

not explicitly made public, none for municipal waste-derived fuels were found in the public domain. Despite this lack of public evidence, one technology provider claims that their fuel (Fulcrum BioEnergy) has been tested, certified and approved for commercial and military aviation worldwide."

[The Reality of Waste-Derived Fuels: Up in the Air](#), Andrew N. Rollinson

"This review has shown that when appropriate system boundaries are applied, a pyrolysis plant for self-sustaining EfW is thermodynamically unproven, practically implausible, and environmentally unsound."

['Patented blunderings', efficiency awareness, and self-sustainability claims in the pyrolysis energy from waste sector](#). Andrew Neil Rollinson, *ScienceDirect*.

Chapter Three

Toxic Chemicals & the Gasification Process

Fulcrum estimates that 30% of the waste it will process will be plastic. Most plastics contain numerous toxic chemical additives harmful to human health¹, and gasification can convert some of these additives into new toxic chemicals such as dioxins and PAHs.

Fulcrum claims toxic chemicals will be “cleansed” from the final product, but even if this is true, these chemicals ultimately will have to be captured and disposed of as hazardous waste and/or they will be emitted into the atmosphere during production or when the final fuel product is burned.

Flame Retardants

Brominated flame retardants (BFRs) are a class of chemicals widely used in plastics to reduce flammability and prevent the spread of fires.

They are used in foams, polystyrenes, and epoxy resins that are used to manufacture electronic casings and wire coatings (examples include the plastic casings for computers, TVs, and home appliances), textiles, furniture foams, carpets, building materials, and are commonly found in plastic children’s toys.

Processing of plastic waste is a significant source of human BFR exposure.

BFRs disrupt male and female reproductive development, alter thyroid development, and affect neurodevelopment. BFR exposure is associated with psychomotor and attention-related IQ performance in children.²

Plasticizers.

The plasticizer group of additives are dominated by phthalates.

Phthalates are chemical additives widely used to produce or promote flexibility and to reduce brittleness in plastics. Phthalates are used as plasticizers in PVC consumer, medical, and building products, as matrices and solvents in personal care products, and as fillers in

Chapter Three

Toxic Chemicals & the Gasification Process

medications and dietary supplements, food and beverage packaging, and children's toys.

Phthalates reduce testosterone and estrogen levels, block thyroid hormone action, and have been identified as reproductive toxicants.

Decreased pregnancy and high miscarriage rates, anemia, toxemia, pre-eclampsia, early menopause, and abnormal sex steroid hormone levels are associated with phthalates.

Phthalate exposures are not only associated with reduced fertility but can affect fertility across multiple generations. Phthalate exposure increases the risk of insulin resistance and has been persistently linked to diabetes. Phthalates are associated with elevated blood pressure, obesity, elevated levels of triglycerides.³

Short chain chlorinated paraffins (SCCPs) are also used widely as plasticizers but have recently been banned by international treaty. They are likely to still be present in many household articles and electronics that end up municipal waste streams.

Stabilizers

Ultraviolet (UV) light stabilizers are chemical additives used to protect plastic building materials, automotive parts, waxes, and paints from deterioration due to UV radiation.

Several UV stabilizers are on the Candidate List of Substances of Very High Concern by the European Chemicals Agency (ECHA) because of their persistent, bio-accumulative, and toxic nature.

The Swiss government has recently submitted a proposal to the Stockholm Convention to list UV-328, for listing as a Persistent Organic Pollutant under provisions of the Stockholm Convention, which would result in a ban on its production and use in countries that are a party to the Convention (the U.S. is not one of the 185 countries that are parties to the Convention).

Several studies demonstrate that UV stabilizers disrupt endocrine function, impeding normal development and inducing estrogenic effects.⁴

Dioxins

Dioxins are considered the world's most toxic substances and there is no safe

Chapter Three

Toxic Chemicals & the Gasification Process

level of exposure. Gasification of plastics containing BFRs, PVC plastics and other plastics containing chloride lead to dioxin formation.

Dioxins are created as byproducts of industrial and combustion processes and occur in the production of plastic products with brominated fire retardants (BFRs) and when plastics with BFRs are incinerated or heated in a recycling process. Dioxins can accumulate in animal and human fatty tissues.

Dioxin exposures affect brain development, ^{disrupt} thyroid and ^{immune} system functions, and are associated with increased risk of multiple cancers, and immune system damage.⁵

Another unintentional byproduct is Carcinogenic Polycyclic Aromatic Hydrocarbons (PAHs). These substances cause cancer and are commonly formed in gasification plants and can be found in emissions.⁶ PAHs are also emitted in coke plants, so this is a particular hazard for Gary residents.

¹Endocrine Society:

<https://www.endocrine.org/news-and-advocacy/news-room/2020/plastics-pose-threat-to-human-health>

² U.S. Environmental Protection Agency:

https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NHEERL&dirEntryId=226582

³National Center for Biotechnology Information

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8157593/>

⁴Endocrine Society

https://ipen.org/sites/default/files/documents/edc_guide_2020_v1_6ew-en.pdf

⁵ U.S. Environmental Protection Agency

<https://www.epa.gov/dioxin/learn-about-dioxin#:~:text=Dioxins%20are%20highly%20toxic%20and,the%20fatty%20tissue%20of%20animals%20>

⁶World Health Organization:

<https://www.who.int/europe/publications/i/item/9789289056533>

Chapter Four

Who Does So-Called “Advanced Recycling” Benefit?

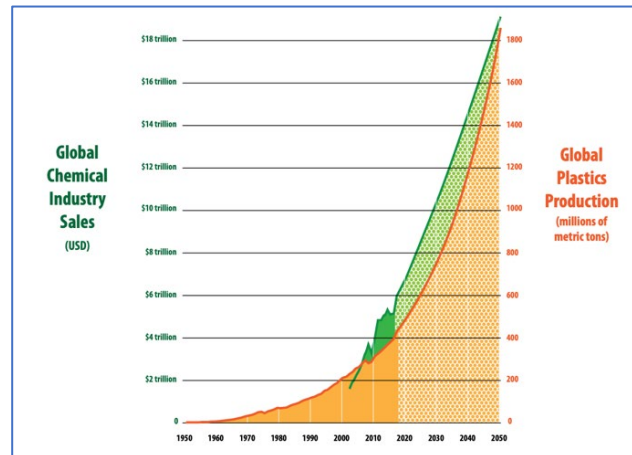
Growing alarm about climate change is forcing the fossil fuel industry to pivot away from fuel manufacture. In response, they are shifting from fossil fuels to plastic production. But they can't produce more plastic unless they find a way to reduce the millions of tons of plastic recycling that is clogging oceans, rivers, and landfills around the world.

In the 1980's plastic producers promoted mechanical recycling of plastic. But mechanical recycling has failed to stem the tide of plastic pollution with only about 9% of all plastic ever produced having been recycled. The rest is dumped or incinerated.

Plastic producers don't want limits imposed on plastic production but cannot now claim mechanical recycling will resolve the crisis of mounting plastic pollution worldwide. So they are vigorously promoting “advanced” recycling, such as the plant proposed by Fulcrum, as the solution.

Though Fulcrum says its waste stream will be only 30% plastic, plastic is inevitably going to be a large part of any attempt to divert waste from landfills.

Those with the most to gain are large corporations that produce and sell large volumes of plastic in the form of products and packaging, such companies such as BASF, Unilever, Procter and Gamble, Mitsubishi Chemical Corporation, Dow Chemical.



These and other companies are partnering with or acquiring engineering start-ups, established chemical recycling companies, and technologies that attempt to convert plastic waste to plastic or fuel.

They are using investor and government funds to acquire property, build infrastructure and run tests. When the majority of these projects fail, they will continue to own the land, equipment, buildings, and permits, all of which can be re-purposed for other uses such as incinerators .

Sources Used to Prepare This Document

Gary Advocates for Responsible Development drew on published material from a wide variety of independent scientific and expert sources with no financial interest in promoting “advanced” or “chemical” recycling projects.

Changing Markets Foundation. Changing Markets Foundation works in partnership with NGOs, other foundations and research organizations to shift market share away from unsustainable products and companies and towards environmentally and socially beneficial solutions. [Hot Tickets and Hollow Promises: Investor Briefing](#), 2021.

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Endocrine Society. Endocrine scientists and clinicians promoting breakthroughs in endocrine science and patient care through education, research and advocacy. [Introduction to Endocrine Disrupting Chemicals](#), 2014

Global Alliance for Incinerator Alternatives (GAIA). A nonprofit organization seeking to catalyze a global shift towards environmental justice by strengthening grassroots social movements and advancing solutions to waste and pollution. [Plastic-to-Fuel: A Losing Proposition](#), 2020; [The Reality of Waste-Derived Fuels: Up in the Air](#), 2021.

Global Waste-to-Energy Research and Technology Council. (Global WTRET) An organization working to advance sustainable waste management around the world. [History of Gasification of Municipal Solid Waste through the eyes of Mr. Hakan Rylander](#)

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Andrew N. Rollinson, PhD and Jumoke Oladejo, PhD. Leading researchers on waste-to-energy technologies. [‘Patented blunderings’, efficiency awareness, and self-sustainability claims in the pyrolysis energy from waste sector](#)

Yale Environment 360, [The Plastics Pipeline: A Surge of New Production is on the Way.](#)

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