Comments of

DEFEND OUR HEALTH

FENCELINE WATCH

PORT ARTHUR COMMUNITY ACTION NETWORK and

BREAST CANCER PREVENTION PARTNERS

on a proposed rule by the U.S. Environmental Protection Agency to revise the

National Emission Standards for Hazardous Air Pollutants (NESHAP) for the Synthetic Organic Chemical Manufacturing Industry (SOCMI),

also known as the Hazardous Organic NESHAP (or HON) rule,

pursuant to the Clean Air Act mandate to protect public health with an ample margin of safety

7 July 2023

Summary. The proposed HON rule, while long over-due and a major step in the right direction, falls far short of meeting the environmental justice commitments of the Biden Administration and the requirement to protect human health from toxic air emissions under the Clean Air Act. This rule, *assuming it's timely adopted as proposed without any weakening changes*, would:

1. Perpetuate **environmental racism** by leaving more than 1.6 million Black and Brown resident, representing 64% of the impacted community, facing serious cancer risk;
2. Only reduce the number of people facing **serious cancer risk** by 21% and those facing **significant cancer risk** by 75%, contrary to EPA policy to strive to eliminate such risk[1];
3. Fail to limit future increases in toxic air emissions due to **petrochemical plastics**, which drive most chemical manufacturing, with production projected to double in next decade;

[1] In EPA's landmark benzene NESHAP adopted in 1989, which was memorialized by the Clean Air Amendments of 1990, the agency stated: "In protecting public health with an ample margin of safety under section 112, EPA strives to ***provide maximum feasible protection*** against risks to health from hazardous air pollutants by (1) ***protecting the greatest number of persons possible to an individual lifetime risk level no higher than approximately 1 in 1 million*** and (2) limiting to approximately no higher than 1 in 10 thousand [100 in 1 million] the estimated risk that a person living near a plant would have if he or she were exposed to the maximum pollutant concentrations for 70 years." (emphasis added) (54 FR 38044).

4. Fail to **sufficiently reduce toxic fugitive emissions** by not requiring all available control technologies, e.g., leakless equipment, infrared monitoring, and automated leak detection.
5. Be based on **significantly underestimating fugitive air emissions** and residual health risks by failing to consider relevant sophisticated emissions measurement studies.

[Individual lifetime cancer risk is "serious" at the 1 in 1 million risk level, "significant" at the 10 in 1 million risk level, and "unacceptable" at or above 100 in 1 million risk level. See page 6.]

Commenters. The submitters of this comment are nonprofit environmental public health and justice organizations that work nationally and in the State of Texas to reduce harm to human health, racial justice, and climate progress attributable to the production and use of synthetic organic chemicals and to chemical releases from the synthetic organic chemical manufacturing industry, including air emissions of ethylene oxide (EtO), a very potent, known human carcinogen linked to breast cancer, leukemia, lymphomas, and other adverse health effects.

Defend Our Health, a public health and social justice organization, works to create a world where are people are thriving, with equal access to safe food and drinking water, healthy homes, and products that are toxic-free and climate-friendly. The staff of Defend Our Health work in eight states with a headquarters office located in Portland, Maine. https://defendourhealth.org/

Fenceline Watch, a Houston, Texas-based environmental justice organization, is dedicated to the eradication of toxic multigenerational harm on communities living along the fenceline of industry. Fenceline Watch advocates to eliminate disparities of environmentally vulnerable communities and seeks to increase effective access to justice- including redress, remedy, and inclusion in the decision-making process. https://www.fencelinewatch.org/

Port Arthur Community Action Network (PACAN), an environmental justice advocacy and community development organization serving the Port Arthur, South East Texas region, keeps the community informed of the issues while seeking justice involving the protection of environmental and community rights. https://www.pa-can.com/

Breast Cancer Prevention Partners (BCPP), a national organization based in San Francisco, California, works to eliminate toxic chemicals and other environmental exposures that lead to breast cancer. BCPP works with communities most highly impacted by the environmental exposures linked to breast cancer, translates science into education and action, presses businesses to make products safer, and passes health-protective laws. https://www.bcpp.org/

Background. The Clean Air Act requires the U.S. Environmental Protection Agency (EPA) to further reduce industrial air emissions of hazardous air pollutants (HAPs) if the residual health risks remaining after technology-based controls are applied still exceed the 1 in 1 million level for cancer risk to the maximum exposed individual over their lifetime. 42 U.S.C. §7412(f)(2)(A). Under a court-ordered timeline, EPA recently reassessed cancer and other health and environmental risks, as well as the current state of air pollution control technology, for more than 50 different HAPs emitted by about 200 synthetic organic chemical manufacturing plants in the United States, many of which are located in Texas and Louisiana.

Finding that the trigger level for cancer risk (and other risks) was exceeded, EPA announced its intent to revise its so-called HON rule to significantly reduce toxic air emissions from the synthetic organic chemical manufacturing industry.[2] On April 25, 2023, EPA's analysis and proposed rule was published in the Federal Register.[3]

Benefits of Proposed Rule. To EPA's credit, and notwithstanding the major shortcomings detailed further below, the proposed rule advances several provisions that advance the aim of improving public health and environmental justice, which include:

- Significant reductions in HAPs emissions through new mandatory controls on sources;
- Even tighter controls on ethylene oxide (EtO), a very potent, known human carcinogen;
- Elimination of cancer risk above the 100-in-one-million risk level for 87,000 people;
- A 91% reduction in cancer risk for 342,000 people above the 50-in-one-million risk level;
- An 80% reduction in overall cancer incidence, i.e. the number of likely cancer cases;
- Tighter controls on flares designed to burn off toxic gases instead of being released;
- Closing the loophole that allows releases during start-up, shut-down and maintenance;
- Mandatory fenceline monitoring for six HAPs, with action levels that trigger more; and
- A community-wide risk assessment of combined risk from other sources and industries;

Shortcomings of Proposed Rule. Despite these projected gains, the proposed rule would fail to fully meet the goals and requirements of environmental justice and clean air policies. (And that's assuming that the proposed rule is timely adopted and enforced without weakening changes that result from chemical industry lobbying and delays from industry lawsuits.)

The following critical deficiencies must be corrected before EPA adopts a final HON rule:

1. The Proposed Rule Would Perpetuate ENVIRONMENTAL RACISM, Contrary to the Environmental Justice Policies of the Biden Administration and U.S.

About 1.6 million people of color would still face serious cancer risk at the one-in-one-million level simply by living within 10 kilometers (6.2 miles) of toxic air emissions emitted by regulated sources from chemical manufacturing plants, *after adoption of the proposed rule*.[4]

[2] U.S. Environmental Protection Agency (April 6, 2023). Biden-Harris Administration Proposes to Strengthen Standards for Chemical and Polymer Plants, Dramatically Reduce Cancer Risk from Air Toxics. News Release. https://www.epa.gov/newsreleases/biden-harris-administration-proposes-strengthen-standards-chemical-and-polymers-plants

[3] U.S. Environmental Protection Agency (April 25, 2023). New Source Performance Standards for the Synthetic Organic Chemical Manufacturing Industry and National Emissions Standards for Hazardous Air Pollutants for the Synthetic Organic Chemical Manufacturing Industry and Group I & II Polymers and Resins Industry, 88 FR 25080. https://www.federalregister.gov/documents/2023/04/25/2023-07188/new-source-performance-standards-for-the-synthetic-organic-chemical-manufacturing-industry-and

[4] Ibid. Table 31, 88 FR 25186. As many as 3.6 million people of color could face serious cancer risk if they live within 50 kilometers (31 miles) of a regulated chemical plant but EPA has not yet released its demographic analysis to confirm the proportion of the larger population at risk of cancer at the 1 in 1 million level who are people of color.

People of color represent 64% of the total population at serious risk of cancer (at the one-in-one-million level), after controls are in place on HAPs emissions from 111 chemical plants.[5] That disproportionate impact is more than 1.5 times the national average since people of color make up about 40% of the U.S. population.

Latinx community residents, who make up 37% of this at-risk population, are over-represented at nearly twice the national average of 19% of the U.S. population. About 917,000 Latinx residents would still face serious cancer risk if the HON rule was adopted as proposed. This represents only a 4% reduction in the number of people at serious risk of cancer after rule adoption.

African-American community residents, who make up 23% of this at-risk population, are over-represented at nearly twice the national average of 12%. About 583,000 Black people would still face serious cancer if the HON rule was adopted as proposed. This represents only a 16% reduction in the number of people at serious risk of cancer after adoption of the proposed rule.

People would also remain disproportionately at-risk of cancer based on socio-economic status if they lived within about 6.2 miles of a regulated chemical plant. For those who would still face serious cancer risk at the 1 in 1 million level after regulation:

- 18% (or 474,000 people) live in poverty compared to national average of 13%;
- 20% (or 513,000 people) have a low educational level (i.e., are more than 25 years old and without a high school diploma) compared to national average of 12%; and
- 9% (or 214,000 people) are linguistically isolated compared to 5% nationally.[6]

For the 29,000 people who live within 10 km (6.2 miles) of 13 chemical plants and would still face a *fifty-times higher cancer risk* (50-in-one-million) after controls are imposed:

- 46% (or 14,281) are people of color, still above the national average of 40%; and
- 29% (or 9,000 people) are Latinx residents, compared to 19% national average.[7]

In its analysis of the proposed HON rule, EPA succeeds at *identifying* environmental justice concerns,[8] consistent with Executive Order 12898, which states:

> "To the greatest extent practicable and permitted by law … each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States."[9]

However, contrary to environmental justice policies and Clean Air Act requirements, EPA fails to adequately *address* environmental justice concerns.

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[5] Ibid. Table 31, 88 FR 25186.
[6] Ibid. Table 31, 88 FR 25186.
[7] Ibid. Table 32, 88 FR 25186.
[8] Ibid. 88 FR 25181-25196.
[9] The President, Executive Order 12898 (February 11, 1994). Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations.
https://www.archives.gov/files/federal-register/executive-orders/pdf/12898.pdf

EPA defines environmental justice as the "fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies." EPA defines the concept further: "[F]air treatment means **no group of people should bear a disproportionate share of the negative environmental consequences** resulting from industrial, governmental and commercial operations or policies."[10] (emphasis added)

Yet, as documented above, people of color will still bear a disproportionate share of exposure to hazardous air pollutants and resulting cancer risk if the HON rule is adopted as proposed.

Further, EPA's fails to cite and analyze the scientific evidence that shows that people of color are also uniquely susceptible to the health effects of toxic air pollutants, in addition to being more highly exposed, due to the cumulative impacts from a combination with other psycho-social stressors including racism, poverty, lack of access to health care and healthful foods, and more.[11]

Under the Clean Air Act, the unique susceptibility of people of color and low-income people to the adverse effects of hazardous air pollutants should be considered as important health factors. Under EPA's benzene NESHAP decision, "all of the health factors" must be considered as "EPA strives to provide protection to the greatest number of persons possible to an individual lifetime risk no higher than approximately 1 in 1 million."[12]

Recommendation: *The proposed HON rule should be strengthened to further reduce hazardous air emissions with the goal of eliminating racial disparities in exposure at all risk levels.*

2. Under this Proposal, 5.7 million People would still face SERIOUS CANCER RISK from Exposure to Toxic Air Emissions, Contrary to Clean Air Act Requirements

Under the proposed rule, serious cancer risk would remain, exposing an estimated 5.7 million people who live within 50 kilometers (31 miles) to lifetime cancer risks of one-in-one-million. (See Table 1 below.) The rule would result in a very modest 21% reduction in the total number of people at this risk level, which would be reduced from 7.2 million to 5.7 million from implementing the rule as proposed.[13]

The proposed rule would achieve only a 75% reduction in the number of people exposed to a significant cancer risk, leaving 570,000 people at that risk level. Under California law, significant risk is defined as a 10 in 1 million lifetime risk level. (See Table 1 and Footnote 16.)

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[10] U.S. Environmental Protection Agency, Environmental Justice: Learn About Environmental Justice, https://www.epa.gov/environmentaljustice/learn-about-environmental-justice

[11] See, for example, Morello-Frosch et al. (2011). Understanding the Cumulative Impacts of Inequalities in Environmental Health: Implications for Policy. *Health Affairs.* 30(5):879-887. https://pubmed.ncbi.nlm.nih.gov/21555471/

[12] U.S. Environmental Protection Agency (1989). National Emission Standards for Hazardous Air Pollutant; Benzene. 54 FR 38046.

[13] EPA, Proposed HON Rule, Table 5, 88 FR 25120.

For people who live even closer to the chemical plants, within 10 km (6.2 miles), the risk reduction would be even less. Only 10% fewer people would be exposed at the one-in-one-million cancer risk level, reducing the at-risk population from 2.8 million to 2.5 million.[14]

Table 1. EPA's proposed rule would still leave millions of people at serious risk of cancer

Hazardous Air Pollutant Emissions from Synthetic Organic Chemical Manufacturing Industry	Lifetime Cancer Risk for People who Live within 50 km (31 miles) of the Chemical Manufacturing Plants (cancer risk expressed as number in one million)					Cancer Incidence (in cases per year)
	≥ 1	≥ 10	≥ 100	> 100	≥ 1,000	
Cancer Risk Level:	**Serious [15]**	**Significant [16]**	**Unacceptable [17]**			
BASELINE - Number of People at Risk (before HON rule)	7.2 million	2.3 million	150,000	87,000	2,900	2
POST-CONTROL Number of People at Risk (after rule)	5.7 million	570,000	4,700	0	0	0.4
REDUCTION in the At-Risk Population (by proposed rule)	21 %	75 %	96 %	100 %	100 %	80 %

EPA has done more in the past to reduce serious cancer risks from hazardous air pollutants. For example, EPA's NESHAP reduced cancer risks from benzene emissions from storage tanks to less than 1 in 1 million for 99% of the entire population that lived with 50 kilometers (31 miles) of the air toxics source.

[14] Ibid. Table 31, 88 FR 25186.

[15] **"Serious"**: The Clean Air Act Amendments of 1990 require that if technology-based standards for hazardous air pollutants "do not reduce lifetime excess cancer risks to the individual most exposed to emissions from a source in the category or subcategory **to less than one in one million**," then EPA must adopt emission standards that provide an ample margin of safety to protect public health, considering costs and feasibility. See 42 U.S.C. §7412(f)(2). Further, precedent-setting EPA policy adopted with the Benzene NESHAP in 1989 states that: "EPA strives to **provide maximum feasible protection** against risks to health from hazardous air pollutants by (1) **protecting the greatest number of persons possible to an individual lifetime risk level no higher than approximately 1 in 1 million**". 54 FR 38044-5.

[16] **"Significant"**: A California state law, The Safe Drinking Water and Toxic Enforcement Act of 1986 (commonly referred to as Prop 65), requires warning of exposures to chemicals that pose a significant risk of cancer assuming lifetime exposure. The implementing regulations state that: "For chemicals assessed in accordance with this section, the risk level which represents no significant risk shall be one which is calculated to result in **one excess case of cancer in an exposed population of 100,000**, assuming lifetime exposure at the level in question." More than that risk level, which is equivalent to a ten in one million, poses significant cancer risk. See 27 CCR §25703(b).

[17] **"Unacceptable":** The EPA presumptively defined an unacceptable cancer risk in its final adoption of the NESHAP for emissions of benzene, a known human carcinogen in 1989: "EPA will generally presume that if the risk to that individual is no higher than approximately **1 in 10 thousand is considered acceptable** …" (That's equivalent to a 100 in 1 million cancer risk level.) However, "EPA may find, in a particular case, that a risk that includes MIR (maximum individual risk) less than the presumptively acceptable level is unacceptable in light of other health risk factors." See 54 FR 38045. This EPA interpretation was preserved by the Clean Air Amendments of 1990. See 42 U.S.C. §7412(f)(2)(B).

However, the proposed HON rule would provide an equal level of health protection from cancer risk to only 89% of the surrounding population of 50 million people who live the same distance away from regulated chemical manufacturing plants. (See Table 2 below.)

According to Table 2, after controls are imposed, the proposed HON rule would also result in:

- Ten times the rate of cancer incidence compared to the benzene rule; and
- Fifty-seven times the number of people at serious cancer risk than the benzene rule.

Table 2. The proposed risk reduction is much weaker than EPA's landmark benzene decision

Residual Cancer Risk, People who Live within 50 km (31 miles) of Emission Sources, Post-Control				
Carcinogen and Source	**Number of People Who Remain at Risk at > 1 in 1 million**	**Percent of Total Population Protected at < 1 in 1 million**	**Cancer Incidence Remaining (in cases per year)**	**Date and Status of EPA decision**
Benzene from storage tanks	0.1 million	99 %	0.04	1989 Final
HAPs from SOCMI plants	5.7 million	89 %	0.40	2023 Proposed

Recommendation: *The proposed HON rule should be strengthened to further reduce toxic air emissions so that the number of people exposed at or above 1 in 1 million cancer risk is eliminated or reduced to the maximum extent feasible.*

3. Rising Demand for PETROCHEMICAL PLASTICS Will Increase Toxic Air Emissions, Cancer Risk, and Environmental Racism from Chemical Plants

Supplying the ever-increasing production of petrochemical plastics drives the production of synthetic organic chemicals and its emissions of hazardous air pollutants.

The manufacture and use of just seven hazardous chemicals by the chemical industry results in air emissions that contribute 90% of the cancer incidence projected to result *after* the HON rule is adopted as proposed.[18]

Every one of these chemicals is used to make petrochemical plastics and/or plastics additives. (See Table 3 below and Wikipedia entries on "Uses" for each of the seven chemicals.)

Residual emissions of ethylene oxide (EtO), after proposed controls are imposed, drives nearly two-thirds of the projected cancer incidence. The majority of EtO supplies the production of

[18] U.S. Environmental Protection Agency (March 2023). Residual Risk Assessment for the Synthetic Organic Chemical Manufacturing Industry (SOCMI) Source Category in Support of the 2023 Risk and Technology Review Proposed Rule. Table 3-3.1, page 59. https://www.epa.gov/system/files/documents/2023-04/SOCMI_RTR_risk_assessment_report_withAppendix_31March2023_ToDocket.pdf

polyethylene terephthalate (PET) plastic, known in its fiber form as polyester.[19] Together, plastic bottles (mostly for beverages) and polyester clothing consumer about half of all PET plastic use.

Table 3. Plastics Production Drives Cancer-Causing Air Emissions from the Chemical Industry

Hazardous Air Pollutant	Contribution to Cancer Incidence	Primarily Used for Plastics?	Some of the Plastics Made with this Chemical	Major End Markets
Ethylene oxide (EtO)	61 %	YES	PET resin and polyester fiber	Bottles and clothes
Naphthalene	7 %	YES	Phthalate plasticizers; alkyd resins	Flexible vinyl; paints
1,3-Butadiene	6 %	YES	Synthetic rubbers (several)	Tires, hoses, belts, etc.
Acrylonitrile	5 %	YES	PAN, ABS, SAN, ASA; rubbers	Many consumer goods
Benzene	4 %	YES	Polystyrene, phenolic resins, nylon	Packaging, many other
Ethylene dichloride (EDC)	4 %	YES	PVC (vinyl)	Building materials, etc
Chloroprene	3 %	YES	Neoprene rubber	Wetsuits, consumer

The production of plastics, which has grown exponentially, is projected to double again by some time in the next decade.[20] That means that related chemical production and its associated air emissions are also likely to double within ten to fifteen years.

In developing its proposed HON rule, EPA improperly failed to consider trends in plastic production and the likelihood that the hazardous air emissions it proposes to partially control will significantly increase in the near future. These increases will erode the health protections advanced by the proposed HON rule. Since a significant portion of the use of plastics is problematic or unnecessary,[21] EPA should take action to curb plastics-related chemical production and associated emissions of hazardous air pollutants.

Recommendation: *EPA should assess future emissions of hazardous air pollutants based on industry's projected growth rates in plastics and chemical manufacturing. To offset these projected increases, EPA should impose caps on chemical production and total emissions of hazardous air pollutants.*

4. The Proposed Rule Fails to Further Reduce TOXIC AIR EMISSIONS by not Requiring Use of Available Technologies that Prevent Equipment Leaks

The proposed HON rule would only reduce by 70% to 74% the so-called fugitive emissions of hazardous air pollutants from leaking equipment at chemical manufacturing plants.[22] This

[19] Defend Our Health (2022). Problem Plastic: How Polyester and PET Plastic and Can Be Unsafe, Unjust, and Unsustainable Materials, page 18. https://defendourhealth.org/campaigns/plastic-pollution/problem-plastic/

[20] Geyer, R., Jambeck, J.R. and Law, K.L. (2017) Production, use, and fate of all plastics ever made. *Science Advances*, 3, 3–8. https://doi.org/10.1126/sciadv.1700782

[21] Pew Charitable Trusts, SystemIQ (2020). Breaking the Plastic Wave: A Comprehensive Assessment of Pathways Toward Stopping Ocean Plastic Pollution. https://www.pewtrusts.org/-/media/assets/2020/07/breakingtheplasticwave_report.pdf; U.S. Plastic Pact (2022). U.S. Plastics Pact's Problematic and Unnecessary Materials List. https://usplasticspact.org/problematic-materials/

[22] EPA, Proposed HON Rule, Table 4, 88 FR 25119.

pollution control rate compares poorly to the 93 % to 99.9% reductions projected from other six other sources of hazardous air emissions such as process vents and wastewater systems.

A typical chemical plant has thousands of equipment connections, each of which routinely leaks, more so if in poor working condition, resulting in significant emissions of hazardous air emissions. On average, an oil refinery or chemical plant will have 12,000 connectors; 7,400 valves; 560 open-ended lines, 100 pumps, 90 pressure relief valves, and 80 sampling connections.[23] Collectively, emissions from leaking equipment are considered "fugitive" emissions, and are often a major source of uncontrolled air pollution.

For its proposed rule, EPA acknowledges that several technologies are used by other industries that could be required in this rule to further reduce hazardous air emissions, especially of ethylene oxide, from leaking equipment. These include requiring the:

- Use of "leakless" (i.e., low-emitting) equipment for valves and pumps;
- Use of optical gas imaging (OGI) (i.e., use of a thermal infrared camera) to find larger leaks faster; and
- Use of leak detection sensor networks (LDSNs) that could potentially identify leaks.[24]

However, in the proposed HON rule, EPA has failed to analyze or require these technologies to further reduce emissions from leaking equipment, but instead weakly asks for comment on whether they should be required and under what conditions. Instead EPA has proposing only that chemical plants be required to monitor monthly and manually for equipment leaks.[25]

Recommendation: *In its final rule, EPA should require chemical manufacturers to deploy all available technologies to further reduce emissions of hazardous air pollutants, especially of ethylene oxide. Infrared monitoring and a smart array of leak detectors should be implemented immediately. Leakless equipment could be phased in over time, and made mandatory during turnarounds when plants are shut down for upgrades and major maintenance.*

5. EPA Significantly Underestimates FUGITIVE AIR EMISSIONS and Residual Risks by Failing to Consider Relevant Sophisticated Measurement Studies

Using state-of-art real-time monitoring technologies, FluxSense, a technical contractor to the South Coast Air Quality Management District, concluded that conventional emissions reporting underestimated actual measured air emissions of volatile organic chemicals (VOCs) by a factor of six and benzene emissions by a factor of 34, on average, from six oil refineries in the Los Angeles area of California.[26]

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[23] U.S. Environmental Protection Agency (2007). Leak Detection and Repair: A Best Practices Guide. https://www.epa.gov/compliance/leak-detection-and-repair-best-practices-guide

[24] EPA, Proposed HON Rule, 88 FR 25196. See also Footnote 174, cited therein.

[25] Ibid. 88 FR 25196-25197.

[26] Mellqvist et al., Emission Measurements of VOCs, NO_2 and SO_2 from the Refineries in the South Coast Air Basin Using Solar Occultation Flux and Other Optical Remote Sensing Methods, FluxSense Inc., Final Report, 11 April 2017, page 94. https://www.courthousenews.com/wp-content/uploads/2017/06/FluxSense-Study.pdf

This study found that the underestimation is likely due to storage tank and fugitive leaks. "Refineries and tank farms are complex environments with a large number of components and numerous potential leak sources (e.g. tank seals, valves, gauges, flares, vapor recovery units, etc.). Many of these components can show degrading performance over time, and to appropriately account for the impact of non-ideal performance in emission inventory reporting is, we believe, an impossible task."[27]

Another study by FluxSense in Southeast Texas found similar results. The researchers measured VOC emissions in real-time from refineries and petrochemical plants over a five-year period using the same advanced monitoring technologies. The measured VOC emissions were 5 to 15 times higher than reported emissions inventories. The concluded that "VOC emissions are systematically and substantially underestimated in current emission inventories."[28]

FluxSense uses Solar Occultation Flux (SOF), an analytical method considered to be the best available technology in Europe for measuring emissions from refineries and chemical plants. This method is included in the European Standard EN 17628. According to the company, "The SOF technique is dependent on direct sunlight. SOF monitors solar radiation over a broad spectral IR region for the detection and quantification of emissions of the specified gases. The SOF technique uses IR spectrometry to analyze sunlight passing through the atmosphere and detected from a mobile system. By driving downwind of the sources, and intersecting the plume with the measurement path, an integrated concentration profile is obtained. The measurements are generally carried out by measuring around the perimeter of the emission sources, making it possible to subtract the upwind component from the downwind measurement after combining the respective path integrated concentrations with wind information to determine gas fluxes."[29]

These research results are directly relevant to EPA's HON rulemaking, which is likely based on underestimated fugitive emissions of hazardous air pollutants, including ethylene oxide. Fugitive emissions from refineries are similar to those from synthetic organic chemical manufacturing in that each facility has thousands of connections. Many hazardous air pollutants, such as ethylene oxide, are also volatile organic compounds, which are directly measurable by the FluxSense technology. EPA must apply these results from the best available monitoring technology, which are published in the peer-reviewed literature, toward revising the amount of fugitive emissions from SOCMI facilities that are the basis for its risk assessment in the HON rule.

Recommendation: *EPA should assess and incorporate these studies and revise it fugitive emissions inventory for hazardous air pollutants upwards accordingly by a ten-fold factor, recalculate the risks, and commit to requiring all available control measures to further reduce fugitive emissions, per Recommendation #4 above.*

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[27] Ibid. pp. 5, 95.

[28] Johannsen JKE et al. (2014) Emission measurements of alkenes, alkanes, SO_2 and NO_2 from stationery sources in Southeast Texas over a 5 year period using SOF and mobile DOAS. *JGR Atmospheres*. 119(4):1973-1991. https://doi.org/10.1002/2013JD020485

[29] FluxSense Inc. Solar Occultation Flux (SOF). https://www.fluxsense.com/technology/solar-occultation-flux-sof/