Hennepin County Staff Underestimate Risks from the HERC Incinerator

Doug Gurian-Sherman, Ph.D.[1] for the Zero Burn Coalition, Minneapolis, MN
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[1] This report is a revision and replacement of an earlier version from October 30, 2024, and corrects a calculation error, changes wording to improve clarity and accuracy, and expands content. Any errors or flaws in this report are solely the responsibility of the author.

Summary

This report is an assessment of Hennepin County's (HC) analysis of air pollution risks from HERC, using its own data, recent science and regulatory information. The report shows that County staff have underestimated the harm from HERC air emissions. They have also incorrectly stated that HERC causes no more harm to residents in neighborhoods near HERC than to more distant parts of the County. This is despite possessing data which confirm greater risk from HERC to nearby residents, many of whom live in environmental justice (EJ) communities, compared to residents of more distant mostly non-EJ neighborhoods. The report also analyses several substantial sources of air pollution risks from HERC that the County has not accounted for.

To determine how County staff arrived at the conclusion that risks from HERC are negligible and that EJ communities near HERC are not at greater risk from it, data from detailed slideshows on HERC risks authored by county staff in February 2022 and July 2024 have been analyzed for this report. The slideshows rely on analysis by Barr Engineering and regulatory agency data, models, and standards.[2] They appear to be used by County staff to influence opinions about HERC risks. For example, the report from staff to the County Commissioners in September 2023 refers to a Barr Engineering analysis and conclusions that match the slideshows, including claims that risks from HERC are equal regardless of distance from it.[3] Additional slides on risk to residents in various census tracts at different distances from HERC that were not included in the slideshows were also obtained from the County. These were used to analyze the relationship between risk from HERC and distance from it. The inclusion of these additional County data makes the analysis in this report more thorough than that of County staff or Barr engineering based on their own data.

This report also considers additional risks from HERC based on recent science research and recent upward revision of risks from several important air pollutants by national and international public health agencies. These and several other risks that are not accounted for by Hennepin County staff are enumerated below.

[2] In this report, we refer to the February 2022 slideshow as the older or earlier slideshow, and the July 2024 slideshow as the later or newer slideshow. There is considerable overlap, but also some differences between these slideshows which we note and discuss.

[3] The Hennepin Energy Recovery Center and its Role in the Solid Waste System: A Staff Report for the Hennepin County Board of Commissioners, Sept. 2023. At: https://www.hennepin.us/-/media/hennepinus/your-government/projects-initiatives/solid-waste-planning/herc-report-board-briefing-september212023.pdf

This report is not exhaustive, because there are several other ways that current incinerator risk assessments underestimate harm.

The risk assessments presented in this report are approximations but can serve as strong indications of substantial limitations in the County's current risk assessment of HERC.

The report shows that:

1) **Using the County's own data, the cancer risk from HERC is calculated to be on average ~3.7-fold higher for the census tract where the HERC is located (N. Loop, hereafter NL) compared to the average of seven non-EJ tracts at a greater distance from HERC. The cancer risk from HERC is about ~2.4-fold higher for six mostly EJ tracts adjacent or close to HERC shown in the slideshows (including N. Loop), compared to the more distant tracts. The non-cancer HERC risk for North Loop is ~3.4-fold higher than for the more distant non-EJ tracts.** This is based on analysis of County data in its earlier slideshow and additional slides in the County's possession that were not included in either slideshow. Our results showing higher risks closer to HERC are *contrary to the County staff conclusion that more distant parts of the County have equal risks from HERC as areas closer to the incinerator*. **This discrepancy is due to the County's inexplicable failure to include its own risk data on census tracts that are farther from HERC and lack of analysis of risk based on distance from it**. Overall cancer and non-cancer risks from all sources of pollution for the inner census tracts are also generally higher.

2) **Furthermore, none of the census tracts used by the County staff for its assessment include parts of the County beyond Minneapolis and adjacent inner suburbs and cities**. A large part of the County farther from HERC, which nonetheless ships waste to HERC to be burned, is not included in the County's risk assessment. However, our analysis in this report strongly suggests that those parts of the County, which are mostly not EJ communities, would be exposed to considerably less risk from HERC because they are more distant from it.

   This analysis also raises questions about why the County excluded 20 of their own slides and their risk data from the slideshows, or why it did not include risk data from tracts in the County farther from HERC. These excluded slides contain the same types of data as the included slides.

   It was not until the new version of the slideshow (July 2024), to our knowledge, that some additional data from Minneapolis and inner suburbs and city census tracts

were added to the County's slideshow. But even so, the newer slideshow was done in a way that obscures the greater risk from HERC to people closer to the facility in mostly EJ communities. The newer slideshow continues to incorrectly claim that risks are the same from HERC for nearby neighborhoods as for those farther away. They also present risk data comparing EJ and non-EJ communities in a misleading way.

Most EJ communities and population in the County are in census tracts in Minneapolis and nearby, many of whom are close to HERC compared to most non-EJ tracts. Therefore, many more people in EJ communities are in fact likely to be exposed to considerably higher risk from HERC than most County residents in non-EJ census tracts. However, there are also several non-EJ census tracts close to HERC that are also exposed to higher levels of HERC pollution.

3) **The HERC permit data shown in the County slideshows are not based on the combined risks of HERC pollutants, such as determined by using MPCA's MNRisks process.** Instead, the risk from each pollutant is calculated and considered separately. On the other hand, HERC produces many pollutants at the same time, which we are exposed to together.

4) **The HERC permit is not based primarily on preventing health risks, but rather the capability of available pollution control technology. Although this pollution control reduces air pollution emissions, remaining emissions are supposed to be assessed for harm to the public in a second regulatory step that was supposed to be completed by 2003 under the Clean Air Act has never been caried out. As recent analysis in this report and by U.S. EPA shows, this remaining "residual risk" is substantial. And as an existing facility, HERC is not required to use the most effective pollution control equipment as would a new facility. This is not based on risk reduction and public health protection but rather costs to HERC. This does not address whether this pollution control eliminates significant risks.**

5) **Federal Court in 2008 required EPA (and hence the states) to update these pollution control equipment standards. The resulting proposed revised standards were not produced for 16 years, until 2024, and are still not adopted.[4]**

[4] Because these are proposed regulations, HERC is not legally out of compliance. But the proposed and long-overdue EPA regulations represent the agency's science analysis of what is needed to protect the public and shows that adherence to the older standards results in harm to public health.

6) **If these greatly overdue standards for existing incinerators were applied, HERC emissions of hydrochloric acid gas (HCl) would *exceed* such a permit by ~8-21% based on HERC emissions data presented by the County staff. NO_2 emissions would range from ~13% below to ~7% above such a revised permit.** If HERC was required to comply with the proposed standards for new incinerators, **it would *exceed* the 10-year average HERC emissions in the slideshows for HCl by ~81 percent (almost double), *exceed* NO_2 standards by ~135% (more than double), and exceed dioxin/furan standards by ~5%.**[5]

7) **The HERC relevant permit was approved in 1998, when risk standards were considerably laxer than is currently the case.** Several important HERC pollutants are now understood to be more harmful at considerably lower levels than was the case in 1998. Using updated pollution standards from the U.S. Environmental Protection Agency (EPA) or the U.N. World Health Organization (WHO) for two important pollutants from HERC, $PM_{2.5}$ (fine particulate matter) and NO_2, the cumulative risks from HERC might exceed acceptable permit limits if they were risk based. For example**, the U.S. EPA standard for long-term fine particulate matter ($PM_{2.5}$) exposure, which causes respiratory and cardiovascular diseases and cancer, was 15 ug/m^3 in 1998 but is now 9 ug/m^3, and was recently set at 5 ug/m^3 by the WHO**. And for NO_2, which causes and aggravates asthma and has other adverse health effects, the **EPA standard was 53 ppb in 1998 while the recent WHO standard is 18.8 ppb, ~2.8-fold lower.**

8) …**None of the risks evaluated in the County slideshows include science that shows that residents in EJ communities are generally considerably more vulnerable and susceptible to air pollution than residents in non-EJ communities**. Therefore, even if exposed to the same amount of HERC pollution, EJ residents would generally be at substantially greater risk, contrary to the assertions of county staff. **For example, one recent major study found that BIPOC people had substantially greater risk of premature death from $PM_{2.5}$ exposure than white people. Black people had ~3 times higher increased risk of premature death than the overall population in the U.S. based on a given increment of pollutant**. It is not possible to say how large the combined effects of the many

[5] The different pollution control requirements between existing facilities like HERC and a new incinerator (new source) are not based on health risk, but rather the greater cost or technical challenges to retrofit existing facilities. Therefore, since the concern in this report is with harm to the public, not costs, we consider it valid to include new facility standards.

factors that make EJ populations more susceptible are. This is due to the need for more research and that there are so many factors that interact to increase harm to people in EJ communities. However, based on available research, such elevated risks are substantial.

9) **The HERC permit, the County slideshows, and other current risk assessments or permits do not include some important toxic emissions, such as PFAS.** For example, it was not known, but suspected, that PFAS would be emitted through municipal waste incinerator smokestacks when the earlier slideshow was produced. But now there is clear evidence that this is the case.

The County slideshows also use the MNRisks program to compare HERC risks to those of all other sources in the County. This purports to show that additive risks from HERC pollutants are negligible. However, the MNRisks program does not include all *criteria* air pollutants.[6] **For example, PM and ozone risks are not included in the MNRisk program.[7] This is a large omission from the County analysis. For example, an independent HERC risk assessment using EPA's COBRA program, which was based only on PM pollution and recent science research, concluded that HERC may be responsible for 1-2 premature deaths per year.**[8] EPA, in its document proposing new incinerator standards, similarly identifies and quantifies substantial health risks that would be avoided by PM and ozone reductions if the new proposed standards were adopted. They also expected unquantified reduced harm from the reduction of hazardous incinerator air pollutants.

MPCA risk assessment, as noted in its MNRisks program, also uses thresholds for determining non-cancer risks.[9] These thresholds are interpreted to mean that there is essentially no risk or harm below the threshold amount. However, considerable research shows that such hard thresholds are not realistic, and harm does occur at lower levels of

[6] There are six criteria pollutants that are major source of air pollution harm. These are CO, PM, NO_2, SO_2, lead, and ground-level ozone. There are 187 hazardous air pollutants, only nine of which require permitted limits by EPA.

[7] Ellickson, K. et al. 2023. MNRISKS: Minnesota statewide screening for health risks from air pollution. Minnesota Pollution Control Agency, St. Paul, MN. See p.21: "Note that criteria pollutants without inhalation health benchmarks, including PM2.5 and PM10, are not included in the calculation of risks. These pollutants are included for evaluating air concentrations and model performance." The absence of ozone was determined by personal communication with former MPCA staff.

[8] Núñez, Y. et al. 2023. Cumulative burden analysis for zip codes 55407 and 55411. PSE Healthy Energy. Oakland CA.

[9] Ellickson, K. 2023. Ibid. see p.60: "Standard risk assessment models include the assumption that non-carcinogenic effects, exhibit a threshold; that is, there is a level of exposure below which no adverse effects will be observed (EPA 1989)."

exposure. **This means that MPCA risk assessments are likely to systematically underestimate non-cancer risks from HERC (and other pollution sources).**

Although it is not possible to produce precise revised values for HERC risk, it is likely that County staff substantially underestimate these risks to County residents, and especially for residents of EJ neighborhoods closest to HERC. The overall exposure and risks from air pollution from HERC together with other sources is also unacceptable, exceeding risk standards.

All of this supports the urgency of closing HERC rather than dismissing risk from it to county residents or deflecting attention from HERC by pointing to considerable pollution from other sources. If the concern for EJ communities by the County is anything more than rhetoric, that urgency must be heeded by closing HERC as soon as possible.

Introduction

County staff have largely dismissed health risks from HERC, as reported in local media[10] and their own slideshows.[11] They have claimed that the risks from HERC air pollution are "negligible" and that HERC is not likely to increase harm to public health.[12] Their perspective relies mainly on several points that do not accurately represent the actual or plausible risks from HERC reflected in recent risk science and regulations. The County staff perspective in its slideshows and Sept 2023 report can be largely summarized as: a) The HERC is operated under Minnesota MPCA permit and is thereby strictly regulated and not allowed to produce harmful amounts of air pollution, b) Contrary to the claims by many community residents, pollution risk from HERC is not concentrated in the communities near HERC, but is spread equally, therefore implying that EJ communities which predominate near HERC do not have a significantly greater health burden from it than residents from more distant parts of the County (which are also generally wealthier and whiter), c) HERC produces far less air pollution than other sources in the County, d) risk from HERC is negligible, and e) HERC is safer than a main current alternative, landfills.

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[10] Magan, C. 2024. Big money and policy changes needed before Hennepin County trash incinerator can close. At: https://www.startribune.com/big-money-and-policy-changes-need-before-hennepin-county-trash-incinerator-can-close/600338616/ "[Activists] say emission from the incinerator contributes to adverse health outcomes in surrounding communities, including higher rates of asthma. County staff and HERC workers dispute these claims, saying the facility's emissions are well controlled and are less of a risk to residents' health and the environment than trucking waste to landfills." For example, a note accompanying slide 2 of the newer slideshow: "The overall impact from HERC's emissions was negligible by itself, and especially when compared with the current background cancer and non-cancer levels."

[11] NcNary, D. 2022. HERC Air Emissions and Impact on Health, PowerPoint slide presentation, 49 slides. *and* McNary, D. 2024. HERC Air Emissions and Impact on Health, PowerPoint slide presentation, 26 slides. As of August 2024, these slideshows have not been made available to the general public. Please contact the author of the current report for copies. However, some of the analysis, conclusions and data from the earlier slideshow are repeated in the County staff report to the county commissioners in September 2023, cited below.

[12] The Hennepin Energy Recovery Center and its role in the solid waste system: A staff report for the Hennepin County Board of Commissioners. September 2023. At: https://www.hennepin.us/-/media/hennepinus/your-government/projects-initiatives/solid-waste-planning/herc-report-board-briefing-september212023.pdf

This report's analysis focuses on flaws in a), b) and d) above. It provides evidence that risks from HERC are greater than the County contends. The third point, c) above, is largely irrelevant regarding the risk from HERC. However, the fact that combined sources of several air pollutants including HERC exceed air quality safety criteria by several fold according to the County's analysis using MNRisks, is consistent with the perspective that any significant source of air pollution that contributes to this, such as HERC, should be eliminated as soon as possible.

The issue of landfills is not the subject of this report. However, a reasonable and robust comparison of risks and benefits of incineration and landfills is difficult to produce, and to our knowledge has not been produced by either the Minnesota Pollution Control Agency (MPCA) or the County.[13] MPCA mostly emphasizes that landfills produce large amounts of the greenhouse gas methane in comparisons between incineration and landfills, and that incineration produces energy.[14] However, burning plastics, mostly made from fossil fuels, and some other materials produces substantial amount of climate-changing carbon dioxide. Hennepin County staff in their 2023 report to the County Commissioners identify several other risks but also note that there are insufficient data on most of these risks, which prevent accurate quantification. Without that, accurate comparisons between landfill and HERC risks are not feasible. And they correctly acknowledge challenges of accurately comparing landfill and incineration risks.[15] Landfill risks are delineated superficially and largely unquantified by the County, or where numbers are provided, they do not begin to approach the rigor of formal risk assessment.[16] The risks or potential risks from landfills and possible increased landfill use if HERC closes are highly incomplete and therefore of limited value. Despite these substantial limitations, the County staff (and MPCA) continue to insist that incineration is greatly desirable compared to landfills.

A recent analysis of Madrid, Spain, analyzed a waste management system with many similarities to Hennepin County, and using several different scenarios of waste

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[13] The waste hierarchy used by Minnesota that places incineration above, and therefore better, than landfills is over 40 years old. It is based on old and often outdated risk science.

[14] During its 2023 session, the legislature removed incineration from its renewable energy sources, as was justified because incinerators like HERC produce large amounts of GHG due to burning plastics and other materials originating from fossil fuels.

[15] The Hennepin Energy Recovery Center and its role in the solid waste system, 2023, ibid.

[16] For example, fires at landfills are mentioned but without any context such as the number per landfill per unit of time (there are many active and closed landfills in the state), how extensive those fires were, whether they might be extinguished with adequate equipment, proximity and density of nearby residents, pollutants emitted, and so forth. Fires at landfills also may be affected by how the landfills are managed. Similarly, additional truck traffic for hauling increased trash to landfills is mentioned without any attempt to determine their risks, or comparison to the greater waste truck traffic already concentrated in the HERC area. There is no discussion about using higher standards for managing landfills. Landfill risks are a legitimate concern, but the report does little to meaningfully address this issue or present a legitimate comparison to incineration.

management and European standards for risks and benefits (which are similar overall to the U.S.). It showed that harm to human health and the environment was greater when incineration was part of waste management, even when landfill use increased under one scenario.[17] The complexity and assumptions about risks and benefits in these analyses, and differences in case studies, make comparisons between Madrid's waste system and Hennepin County difficult. But this recent research does broadly challenge the arguments of those such as MPCA and the County that landfills are generally and clearly more harmful than incineration.

This report's assessment of HERC air pollution risks analyzes two of the primary documents that the County relies on to attempt to support and demonstrate points a), b) and d) above, which are the topics addressed in this report. These County documents consist of slideshows produced in February 2022 and July 2024 by County staff using analysis from Barr Engineering.[18] The slideshows include the results of the MPCA risk assessment process and other data the County uses to support their first three points above.

Analysis of Risks from HERC Air Pollutant Emissions

Review of the County slideshows reveals that the slides and their accompanying notes substantially underestimate the risks from HERC air pollution to County residents, and especially to those living near the HERC in EJ communities.

1) The slide showing HERC pollutant risks below permit levels (slide 6 in the earlier slideshow, reproduced below as Figure 1), is not based on cumulative risk. In other words, the risks for each listed pollutant are determined separately to derive the permit-based acceptable exposure levels. However, residents are exposed to all pollutants and other stresses together. That the effect of pollutants may combine to cause harm is not only intuitive, but also recognized by scientists and recently by the State as a legitimate weakness of most current and past risk assessment.[19] This

[17] Istrate, I-R. et al. 2021. The impact of incineration phase-out on municipal solid waste landfilling and life cycle environmental performance: Case study of Madrid, Spain. *Sci. Total Environ*. https://doi.org/10.1016/j.scitotenv.2020.142537
This research benefitted from combining materials flow analysis with life cycle assessment (LCA) and using substitution of resources scenarios where increases in recycling occurred and renewable energy sources increased over time. Previous research that favored incineration over landfills often used only LCAs.
[18] McNary. 2022. ibid
[19] There are several lines of evidence that the State recognizes the legitimacy and need for cumulative impacts risk assessment. In its 2023 legislative session the State passed a cumulative impact law for EJ communities in the state. This validates the legitimacy of the concerns about cumulative risk to EJ residents, as does recent science. Regulations to implement that law will take several years to develop. Furthermore,

discrepancy between cumulative risk and permitted emissions is one of several reasons that notes accompanying slide 2 of the newer slideshow are misleading in claiming that permits for HERC would not allow risks above safe levels. If the cancer or non-cancer risks from each individual pollutant are combined to reflect how we are actually exposed to them, those risks would be considerably higher than when each is considered individually.

One reason that cumulative impacts have rarely been used for risk assessment is that it is challenging to determine exactly how these pollutants interact and to quantitatively determine the outcomes of those interactions. This is in large part because of the many possible combinations of pollutants and the many diseases and molecular and physiological processes that may be involved. *It is important to recognize that the technical and regulatory challenges of developing experimental risk data for combinations of pollutants do not alter the fact that many or most pollutants do act together and with other stresses to cause harm rather than independently as is the default of most current regulations*.[20]

As noted above, MPCA considers non-cancer risks below thresholds based on their standards, or benchmarks (incremental risk limits) to be essentially zero.[21] On the other hand, much recent research finds significant health risks below standard thresholds.[22] This means that even where non-cancer thresholds are not exceeded in either permits or MNRisks analyses, harm may be occurring. This

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MPCA uses an additive cumulative impact assessment in its MNRisks program, and a limited cumulative risk law was passed by the State in 2008.

[20] Simply adding risks from different pollutants is a rough measure. For example, different pollutants often affect different systems in the body which may or may not interact with each other in simple additive ways. Rather than acting additively pollutants may act synergistically, antagonistically to each other's effects, or not interact in any appreciable way. Therefore, an important regulatory decision is whether to potentially err on being more protective of public health without highly definitive risk science, or to wait until such science is available, which often takes years or decades, if it is ever achieved. Regulatory agencies in the U.S. typically require high levels of evidence of harm before making regulatory decisions, while European law sometimes recognizes a precautionary approach.

[21] Ellickson, K. 2023. Ibid. see p.60, ibid.

[22] Burnett, R.T. et al. 2014. An integrated risk function for estimating the global burden of disease attributable to ambient fine particulate matter exposure. *Environ Health Perspect.* 122:397–403; http://dx.doi.org/10.1289/ehp.1307049 ; Kelly, F.J. and J.C. Fussel. 2015. Air pollution and public health: emerging hazards and improved understanding of risk. *Environ. Geochem. Health*. 37:631–649; Wei, Y. et al. 2024. Exposure-response associations between chronic exposure to fine particulate matter and risks of hospital admission for major cardiovascular diseases: population based cohort study. *BMJ* 2024;384:e076939 http://dx.doi.org/10.1136/bmj-2023-076939; U.S. EPA. 2024. Regulatory Impact Analysis for the Proposed Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Large Municipal Waste Combustors, EPA-452/R-24-007, at p. 4-12.

underestimation may be exaggerated in permits where risks are determined for pollutants individually because that reduces the likelihood that pollution thresholds would be exceeded as with combined pollutant risks.

Hennepin County and MPCA acknowledge the relevance of applying cumulative risk assessments. Slides 41-46 of the earlier slideshow and 15-24 of the latter slideshow apply a simple (limited) cumulative risk assessment using MNRisks,[23] by adding the risks from several, but not all, air pollutants from multiple sources. This assessment focuses on hazardous air pollutants rather than including all the important *criteria* air pollutants.[24]

The values shown in Figure 1 below represent the percentage of allowed pollutant emissions rather than risk. However, these permitted emissions ultimately are intended to reflect standards set by U.S. EPA (or sometimes other agencies) that say how much of these individual pollutants we may be exposed to for acceptable harm as defined by the agencies. Unfortunately, the current HERC permits are not based on health risk, as discussed below.

It is not possible here to arrive at a precise value for cumulative risks from combining the individual pollutant risks from the permits. But it would undoubtedly be substantially higher than is expressed in the permits.

Recent science, discussed below, also shows that the risks from these pollutants are considerably greater than when the HERC permits were issued. This means that to be safe we should be exposed to correspondingly less.

A note in slide 32 of the earlier slideshow suggests that these permit limits can be safely exceeded because of built-in safety factors in the permit standards. However, as discussed below, formal risk assessment based on safety margins has not yet been performed for the permit limits for each pollutant.

Furthermore, the idea that permit limits can be safely exceeded represents a questionable interpretation. The CAA "adequate margin of safety" or other safety factors address *uncertainty* inherent in several aspects of the risk assessment

[23] MNRISKS. 2023. Statewide screening of health risks from air pollution: Analysis of air emissions data to show potential cumulative health impacts from all sources of air pollution. At: https://www.pca.state.mn.us/sites/default/files/aq9-29.pdf

[24] The six criteria pollutants, which were included in the original 1970 version of the Clean Air Act, are particulate matter, lead, $N0_x$, SO_2, ground level ozone, and CO.

process. This is *necessary* to ensure that people will be as safe as the goals set by the standards. Major litigation concerning the CAA adjudicated and interpreted the margin of safety concept. Among other points, the court noted: “Moreover, it is significant that Congress has recently acknowledged that more often than not the "margins of safety" that are incorporated into air quality standards turn out to be very modest or nonexistent, as new information reveals adverse health effects at pollution levels once thought to be harmless.”[25] This observation has been confirmed many times over the ensuing decades, and is also discussed in this report.

For example, the court affirmed that a 30 ug Pb [lead]/dl standard provided an acceptable margin of safety for a susceptible population (children): “As previously noted, the Administrator's selection was based on his finding that EP [erythropoietin] elevation at 30 ug Pb/dl is the first adverse health effect of lead exposure, and... will allow an adequate margin of safety in protecting children against the more serious effects of lead exposure anemia, symptoms of which appear at blood lead levels of 40 ug Pb/dl and central nervous system deficits which begin to occur at blood lead levels of 50 ug Pb/dl.”[26] In other words, the margin of safety was accepted to be only 33% below acknowledged seriously harmful levels of lead. Additionally, the following paragraphs of the ruling note that scientists were concerned that EP elevation was indicative of harm, even though it did not involve frank disease symptoms, and that EP elevation could occur at levels of 15-20 ug Pb/dl. In other words, the acceptable margin of safety did not account for the potential of harm at (or below) the standard accepted by EPA and affirmed by the courts. These margins proved to be wholly inadequate, as shown by subsequent research resulting in the current standard of 3.5 ug Pb/dl, and recognition that no known lower threshold for harm exists.[27] Moreover, there are additional reasons why existing safety margins are insufficient to avoid harm, some of which are discussed in this report. Other safety factors used in risk assessment, including in the setting of toxicity benchmarks, may be of greater magnitude. But the principle of the role of uncertainty in risk assessment should be clearly understood.

Similarly, in evaluating risks from hazardous air pollutants, EPA considered an ample margin of safety to be one in 1 in a million for cancer risk as a whole, but may accept one in ten thousand cancers for a person living near a pollution emitting

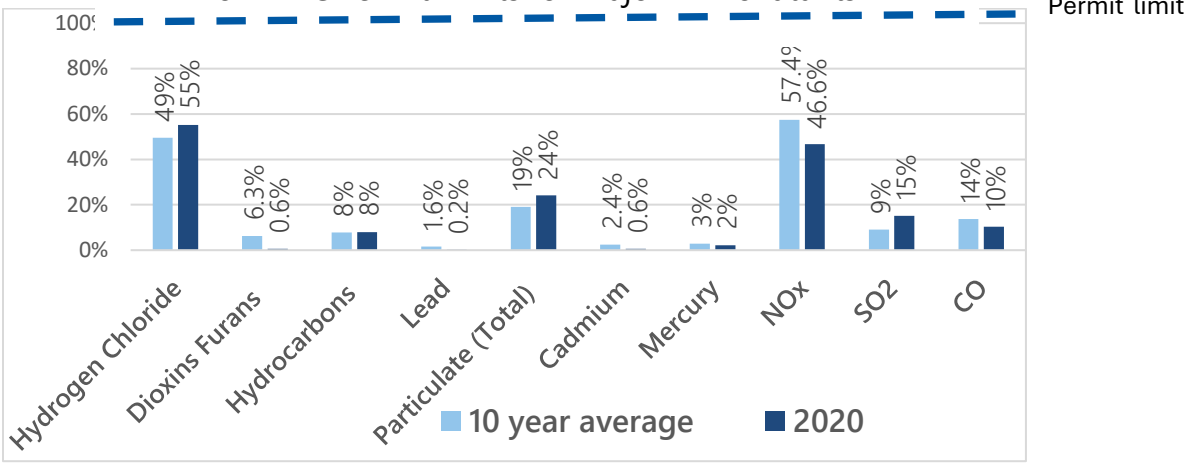
[25] Lead Industries Ass'n v. EPA, 647 F.2d 1130 (D.C. Cir. 1980) :: Justia, accessed Sept 20, 2024.

[26] Lead Industries vs. EPA, ibid

[27] Allwood, P.B. et al. 2022. A historical perspective on the CDC childhood lead poisoning prevention program. *Amer. J. Public Health*.

facility, also taking costs and technology into consideration when setting these standards.[28] Given the common placement of pollution sources historically in BIPOC and poor neighborhoods, it is especially unacceptable on environmental justice grounds to favor the health of those living farther from a facility over those living near it. This risk for EJ communities is also further elevated compared to non-EJ communities (see below), which EPA (and MPCA) do not include in their risk assessments.

Figure 1: Slide 6 From Barr Engineering and Hennepin County Slide Show from February 1, 2022, Showing Percent of HERC Permit Limits for Major Air Pollutants



2) The amount of air pollution that HERC permits allow it to release is not based on public health risk assessment. Instead, it is based on how well available pollution control technology removes pollutants.[29] While this reduces the amount of air emissions, it does not necessarily reduce them to levels that are not harmful to public health. In fact, for several reasons discussed in this report and this section, it is likely that emissions allowed under the current permit are harmful to the public.

   According to the slideshows the pollutant emission levels for major HERC pollutants are shown as percentages of permit limits in Figure 1 (or mentioned in the notes for slide 5 of the newer slideshow). The dotted horizontal line represents 100% of permit limits. HERC pollutant limits are listed in the permits and have not

[28] U.S. EPA. 1999. Residual risk: Report to Congress. EPA-453/R-99-001. At: https://www.epa.gov/sites/default/files/2013-08/documents/risk_rep.pdf

[29] U.S EPA. 2024. Controlling Hazardous Air Pollutants. https://www.epa.gov/haps/controlling-hazardous-air-pollutants

changed since the permit from 1998, which is based on 1995 U.S. EPA pollution standards with three revisions from 2006: cadmium limits were reduced from 40 ug/m^3 to 35 ug/m^3, mercury limits were reduced from 60 ug/m^3 to 50 ug/m^3, and lead limits were raised from 300 ug/m^3 to 400 ug/m^3.[30] These 2006 revisions are included in the 2023 permit along with the unchanged 1995 limits. When pollution safety standards are changed, such as through periodic EPA review, they are updated by Minnesota in its regulations and the Minnesota Department of Health. The appropriate regulations are listed along with the individual pollutants in the permits.

If risk standards for HERC's were based on recent science instead and reflected directly in the permits, that could in effect lower the horizontal line which reflects "accepted" levels of risk, making it closer to or below the actual HERC emissions (or equivalently, the bars in the graphs would be raised relative to the limits). This means that individual pollutant emissions could be closer to or exceed what HERC permit standards should be if they were based on the most recent science and/or newer federal or international public health agency standards.

For example, in 1998 (and 2006) the accepted long term (annual) average EPA exposure standard for $PM_{2.5}$ was 15 ug/m^3 and for short term exposure (24 hour) was 65 ug/m^3.[31] The long-term standard as of 2024 is 9 ug/m^3 and short term is 35 ug/m^3. This is ~40% lower for long-term risk, and the short-term risk emissions allowed would be ~46% lower.[32]

However, the WHO recently recommended (2021) limits for long- and short-term exposure of 5 ug/m^3 and 15 ug/m^3, respectively.[33] If these more protective standards

[30] Federal Register. 2024. Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Large Municipal Waste Combustors Voluntary Remand Response and 5-Year Review. Vol.89, no. 15. p. 4243-4268. See Table 2 for existing emissions standards, which match 1998 and 2023 HERC permits limits, with the exception of volatile organic compound (VOC) limits which are included in the HERC permits but not the EPA standards. VOC is not addressed here.

[31] U.S. Environmental Protection Agency. 2024a. Timeline of Particulate Matter (PM) National Ambient Air Quality Standards (NAAQS). https://www.epa.gov/pm-pollution/timeline-particulate-matter-pm-national-ambient-air-quality-standards-naaqs last accessed March 15, 2024

[32] Note that short- and long-term risks cannot be distinguished in the permitted emissions levels of slide 6, so the calculations here are only a rough approximation for illustrative purposes. Additionally, the permit's emission levels are not the same as the safety standards (often called reference concentrations) noted here but rather are amounts of allowed emissions. However, as noted above, such emission levels ultimately must be linked to and reflect the safety standards. Typically, MN uses U.S. EPA standards but sometimes uses CA standards.

[33] WHO. 2021. ibid

were used, risk-based emission allowances for $PM_{2.5}$ would be ~66% lower and ~77% lower for long- and short-term limits respectively.

Similarly, the long-term U.S. EPA exposure limit for NO_2 as of 1998 was and still is 53 ppb (last evaluated by EPA in early 2018)[34], while the WHO standard as of 2021 is 18.8 ppb (there was no short-term U.S. standard when the 1998 HERC permit was approved).[35] In other words, ~65% less than the EPA standards (or, EPA allows ~2.8 time more than WHO would). It is likely that HERC would exceed such risk-based standards.

However, the current HERC permits are not based on risk assessment, but rather on the limits of available pollution control equipment as noted above.[36] These are so-called maximum achievable control technology (MACT) standards for incinerators as delineated in section 129 of the federal Clean Air Act (CAA). As described by the EPA in a report on risk assessment of hazardous air pollutants: "The fundamental approach is the use of available control technologies or work practice changes to achieve emission reductions in a timely manner for as many of the listed HAPs [hazardous air pollutants] as possible, **without explicit consideration of a HAP's inherent toxicity and potential risk**." [emphasis added].[37]

These standards may or may not actually provide levels of control that satisfy risk-based standards. Whether this is the case is not usually formally determined until a second assessment is performed for hazardous air pollutants under CAA section 112 (f), which evaluates so-called residual risks from emissions of each hazardous air pollutant remaining after control technologies have been applied. This second step is supposed to occur under the CAA within eight years of MACT standards. If at that stage it is found that national risk limits are exceeded, further measures should be taken to reduce emissions.[38]

For municipal waste incinerators, however, this second step has not been taken. Instead, original MACT standards were applied in 1995, and these were adopted by Minnesota and applied to HERC in its 1998 permit. These standards were updated

[34] U.S. EPA, Integrated Science Assessment (ISA) for Oxides of Nitrogen – Health Criteria (Final Report, January 2016). At: https://assessments.epa.gov/isa/document/&deid=310879
[35] WHO. 2021. ibid
[36] Federal Register. 2024. Ibid.
[37] U.S. EPA. 1999. ibid.
[38] U.S. EPA. 1999. Ibid.

for three of the nine federally regulated specified incinerator pollutants in 2006, as noted above. But this was still based upon MACT standards.

Therefore, claims by the County staff that MPCA would not allow HERC permits that harm the public are not accurate.[39] At this stage we simply do not know, based on the permit process alone, whether the applied MACT standards in the HERC permits prevent such risks because the required residual risk assessments that would provide that information have not been made. However, based on substantially more stringent standards from recent science for PM and NO_2 alone, it is possible that residual risks would exceed EPA or international standards. And as discussed below, analysis by EPA conducted in the process of proposing new MACT standards, it is likely that current HERC emissions are significantly harming public health.

Additionally, a lawsuit in 2008 led to a federal district court decision that found that EPA had improperly applied its regulations to set the original 1995 and 2006 MACT standards.[40] In other words, the court found that those standards did not comply with the CAA requirements. This legal ruling required revision of the MACT standards used by HERC. However, EPA did not produce proposed revised standards until 2024, or 16 years after the court required EPA to make these changes. Now the adoption of these new standards is being further delayed.

The proposed revised MACT standards set considerably lower pollutant limits than are found in the current deficient HERC permits.[41] If the proposed revisions were followed, HERC's 2020 HCl emissions from the County slideshows would *exceed* such a permit by ~21%, and the 10-year average annual emissions would be exceeded by ~8%.[42] The NO_2 10-year average would *exceed* such a permit by ~7% and 2020 emissions would be ~87% of the emission limits (~13 percent below the limit). Instead of 24% and 19% of PM limits of the 1998 permit for 2020 and 10-year average emissions respectively, HERC would have produced ~82% and ~65% of a permit compliant with the proposed and long overdue standards. The other

[39] The Hennepin Energy Recovery Center and its Role in the Solid Waste System: A Staff Report for the Hennepin County Board of Commissioners, Sept. 2023 at: https://www.hennepin.us/-/media/hennepinus/your-government/projects-initiatives/solid-waste-planning/herc-report-board-briefing-september212023.pdf; see p. 44, third bullet.
[40] Cited in Federal Register. 2024. Ibid.
[41] Federal Register. 2024. Ibid. The proposed MACT standards, as well as the old ones, are shown in Tables 2 and 3 for existing and new incinerators respectively.
[42] These values were calculated by determining the ratio of the proposed new standards and the old standards for each pollutant and multiplying the result by the emission percentages for each pollutant supplied in figure 1.

pollutants covered by HERCs permits would be considerably closer to allowed limits than the County claims as well.

If HERC was a new facility, its HCl 10-year average annual emissions would *exceed* those stricter standards by ~81% and exceed the 2020 emissions by ~104%. Dioxins and furans emissions would exceed the 10-year average by ~5%. NO_2 emissions would exceed the 10-average by ~135% and 2020 emissions by ~91%. PM would be only ~3% below the allowed limit for the 10-year average HERC emissions and would exceed such a new source permit by ~22% for 2020 emissions. However, existing incinerators are less strictly regulated than new facilities not because of risk considerations, but to reduce facility costs that would be incurred by using the best control technology or because retrofitting may be technically difficult. In other words, existing facility standards potentially compromise health to reduce costs to the industry.

EPA also did a partial cost-benefit analysis based on the adoption of its proposed standards for current incinerators nationally. This generally shows substantial health benefits above the current MACT permit standards used for HERC. This contradicts County staff claims that adherence to HERC permit standards result in negligible risks. According to EPA's assessment, that is probably not true when current MACT standards are used, as is the case for HERC.

Furthermore, monetized health benefits were applied to reducing PM and ozone emissions alone. PM reductions were based on reducing both directly produced PM and indirectly produced PM caused by SO_2 and NO_2 emissions. HERC produces substantial amounts of all three pollutants, but it produces NO_2 in amounts that may exceed the proposed standards, as noted above.[43] The annualized health benefits for applying the proposed PM and ozone standards were determined to range from $290 million to $1.1 billion per year for the existing 57 U.S. incinerators (over a period of 20 years). On a rough average basis, this amounts to ~$5.09 - ~$19.30 million dollars of health benefit for PM reduction per incinerator per year.[44] EPA notes that additional health benefits are likely from reduction of other incineration pollutants that were not monetized, in particular HCl, cadmium, lead and mercury.

[43] For NO_2 only, the proposed new emissions standards are based on the latest EPA ambient short-term emissions standards from 2018.
[44] This is only a rough average estimate, since each incinerator produces different amounts of emissions of these pollutants.

The analysis above based on either new more stringent EPA or WHO standards or by implementing the proposed new MACT standards, or both, also mean that a cumulative assessment based on combining these revised emissions limits would result in considerably higher risks than is reflected in the current permit.

In summary, the County has presented to the public in its slideshow and its report to the County Commissioners in September 2023 an analysis that is based on outdated risk standards and permit limits that were found to be improperly set by EPA decades ago by a federal court. These permit standards also do not include the required CAA residual risk assessment for HERC emissions. County staff therefore give an inaccurate and underestimated assessment of HERC risks. HERC emissions would likely exceed or nearly exceed the newer proposed MACT standards for several pollutants. And based on EPA cost benefit analyses, the old MACT standards used for the HERC permits allow substantial public health harm. This harm would likely be shown to be even greater if newer more rigorous EPA, and especially WHO, standards were applied.

MPCA and MN Department of Health typically do not use the WHO standards noted above. However, the WHO standards are supported by rigorous scientific risk assessment. Also, because the WHO standards for NO_2 were revised downward considerably in 2021 based on recent research, while the EPA has not reviewed those standards since 2018, it is possible that EPA will likewise lower its acceptable exposure levels when it next reviews this pollutant. If we are considering harm to Hennepin County (HC) residents based on the best and most recent science, rather than limiting ourselves to current outdated U.S. and MN regulations, these more protective standards should be applied, especially in EJ communities.

3) Risk assessment and other data show that residents closer to HERC and especially EJ communities are at higher risk from the incinerator's air pollution than other residents of the County. But the County slideshows claim that exposure to risks to residents from HERC air emissions is equal regardless of where they live. They also do not acknowledge higher vulnerability or susceptibility of EJ populations to harm from a given amount of pollution. Together, proximity and greater susceptibility and vulnerability raise risk for EJ neighborhoods close to HERC, contrary to the assertions of the slideshows.

There are Greater Risks from HERC to the mostly EJ Communities Closer to the Incinerator than to more Distant Communities in the County

The conclusion slides (slide 47 and 25 in the older and newer slideshows, respectively) claim that: "HERC is not likely to cause more harmful cancer or non-cancer health effects in one part of the community than another **(equally low impact on surrounding communities)**" [emphasis added].[45] This is one of the three main conclusions of the slideshows about HERC risk. This conclusion also appears in slightly modified form in the September 2023 County staff report about HERC to the County Commissioners.[46] The County may feel this is important because of concerns that if residents near the facility are subjected to a disproportionate amount of harm from HERC, that would be an especially unfair burden because many of these residents are in EJ communities.[47] Although not explicit about EJ residents, the implications of the county's argument is clearly that people in EJ neighborhoods closer to HERC are at no greater risk from the incinerator than those farther from it.

It is unclear how the County concluded this, contrary to the assessment in this report.[48] The County slideshows show the total risk from many pollutants and sources and the contribution to the total risk contributed by HERC for each census tract separately, but there is no analysis of how HERC risks vary with distance.

Figure 2 below, which reproduces slide 40 from the earlier slideshow (and slide 14 in the newer slideshow), shows 26 selected census tracts in and near Minneapolis. The slides used to show risk assessment for HERC in the earlier slideshow are from only six of those tracts. The County shows total risks from all sources, and risks from

[45] I asked Mr. McNary, the author of both slideshows, via email whether "surrounding community" meant those six nearby tracts alone, or a wider portion of the County. Mr. McNary responded by email: "When referencing the "surrounding community" on the conclusion slide it is intended to communicate a broader area in county and shown on slide 40."

[46] The Hennepin Energy Recovery Center and its Role in the Solid Waste System, ibid. at p.45 "HERC emissions are not likely to cause more cancer or non-cancer health effects in one part of the community than in another."

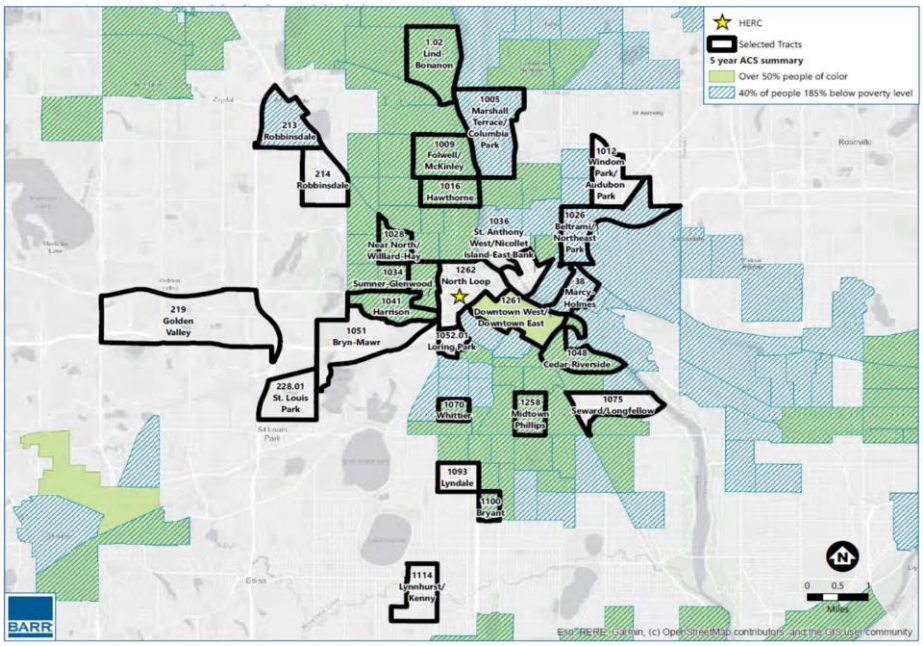
[47] For example, a note on slide 1 of the newer slideshow reads: *"Do emissions from HERC create an unacceptable health risk to people and is that risk disproportionately distributed more (higher risk) to people of color. Will shutting down HERC have a positive health impact in communities near HERC?*
When you see articles and opinions on HERC closing, the focus is typically on emissions – "HERC emits A, B, C pounds or tons of X, Y, Z – whether it be lead, mercury, nitrogen oxides, particulate matter, dioxin. These pollutants are linked to asthma, heart disease, increased risk of death from COVID." You may also see a focus on health impacts in a nearby community – incidence of asthma, for example – being tied to HERC emissions."

[48] In the staff report to the County Commissioners from Sept. 2023, it is claimed that the risks from HERC are the same for "the community" in footnote 31. Community is not defined in the report, but since the report addresses the HERC issue for the entire county, it is not unreasonable to conclude that the community refers to the entire county.

HERC, for each of these six census tracts separately. Those six tracts are the closest to HERC: One is North Loop (NL), where HERC is located, four are adjacent to NL, and one nearly as close. These are the same six tracts as in slides 15-20 of the newer slideshow. Three of the six are EJ tracts. However, the County staff possesses additional slides with similar risk assessments that are not included in the slideshows. These slides include separate risk assessments for each of the 20 other selected tracts shown in Figure 2.

This report analyzed risks from HERC for seven of those non-EJ tracts farthest from HERC and compared them with NL alone or NL plus the five nearby tracts used in the County slideshows. This reveals that there is substantially more risk from HERC in nearby tracts compared to non-EJ tracts farther from HERC, contrary to the assertion in the slideshows by county staff.[49]

Figure 2: Slides 40 and 14 from the Earlier and Newer County Slideshows: Census Tracts



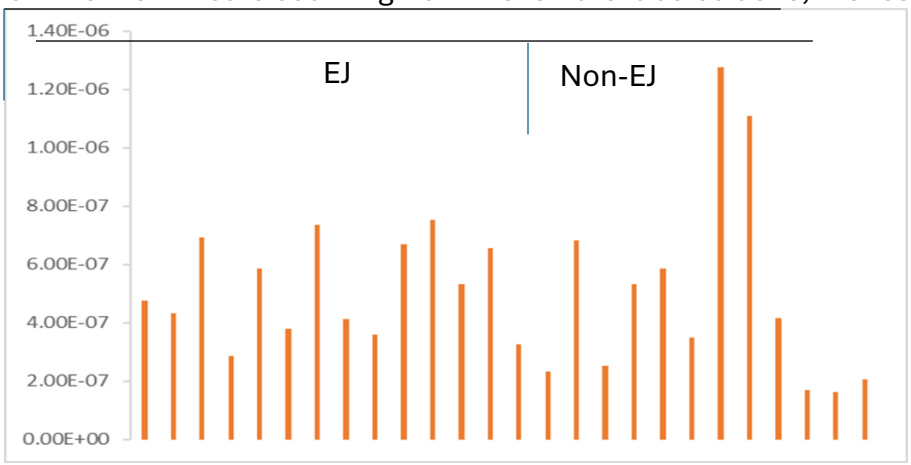
[49] To do this analysis, the HERC risk values were calculated by multiplying the total risk from all pollutants by the percent contribution to this value by HERC for each slide for each tract. The total risk values from all pollutants were derived by extrapolation between values from the graphs in the slides. The mean values for the sets of NL or NL plus the five nearby tracts was then compared to the mean risks for the seven non-EJ tracts farthest from HERC in all directions available (except north because only EJ tracts were found there). This was done by calculating the ratio of NL alone, or the original nearby five tracts plus NL, then dividing the mean risk of the nearby tracts by the mean for the seven more distant non-EJ tracts to determine which set of tracts had higher risk from HERC. This was done for both cancer risk and non-cancer risk separately. Ratios above one indicates higher risks to residents of the nearby tracts from HERC. The tracts more distance from HERC that were used in these calculations were: Robbinsdale (214), Golden Valley, St. Louis Park, Lyndale, Lynnhurst/Kenny, Seward/Longfellow, and Windom Park/Audubon Park. The tracts used for this analysis closer to HERC are: North Loop, Loring Park, Near North/Willard-Hay, Sumner-Glenwood, Downtown West/Downtown East, and St. Anthony West/Nicollet Island-East Bank.

Based on this analysis, the cancer risk for residents of NL from HERC emissions is ~3.7-fold greater than the average of the seven outlying non-EJ tracts. It is ~2.4-fold higher for NL plus the five nearby tracts compared to the outlying tracts. The non-cancer risk ratio comparing NL to the seven outlying tracts is ~3.4 (3.4-fold higher). So contrary to the statement in the slideshow conclusion slides, the risk from HERC is not "equally low" for more distant tracts.[50]

In the newer slideshow, slides 21-24 compared risks for 14 EJ tracts and 12 non-EJ tracts. Figure 3 below reproduces slide 22 in the newer slideshow showing the HERC cancer risks for EJ and non-EJ census tracts shown in Figure 2 above. In Figure 2 there are 15 EJ and 11 non-EJ tracts, so apparently one EJ tract has been counted as non-EJ in Figure 3, complicating our assessment. We strongly suspect that the mislabeled tract is Downtown West/Downtown East because in the 27-slide set, it is not labeled as EJ, while in Figure 2. Downtown West/Downtown East should be considered as an EJ tract due to its proportion of people color over 50%.

Once again there is no analysis of how risk from HERC varies by distance from the incinerator, despite the county's claim that HERC risk is the same regardless of distance. Two of the slides, 22 (Figure 3) and 24, show only what is labeled as the HERC contribution to the risk split between EJ and non-EJ tracts. There is no analysis in these or other slides of risk vs. distance from HERC. The specific tracts are also not identified by name in these slides so there is no straightforward way to determine how far each is from HERC. This is important because as we noted, several non-EJ tracts, including NL itself, are located very close to HERC.

Figure 3: HERC Cancer Risks for 26 EJ and Non-EJ Census Tracts in Hennepin County. In the slideshow the first 14 bars counting from the left are labeled as EJ, the rest (12) as non-EJ



[50] Therefore, the relative amount of air pollutants from HERC that nearby residents are exposed to, compared to the seven non-EJ tracts farther from HERC, would be similar to the risk ratios. Cancer risk and non-cancer risk ratios differ because some pollutants contribute to one or both, and to different degrees, as well differences in dispersion rates.

Risks (cancer or non-cancer) from HERC in Figure 3 and slide 24 are much higher for two of the tracts included as non-EJ tracts than for any others, but there is no way to know from the slides how close to HERC these tracts are. Therefore, we checked the risk data from the slides for the 11 non-EJ tracts shown in Figure 2 to find those with the highest risk and their relative distance from HERC. The second highest HERC cancer risk non-EJ tract appears to be N. Loop, the site of HERC. This is based on value matching Figure 3 and risk calculations for the tracts. None of the other non-EJ tracts from Figure 2 match the highest cancer risk tract shown in Figure 3. However, the cancer risk for Downtown West/Downtown East, which is mislabeled as non-EJ, does match. Therefore, the highest cancer risk value tract should be reassigned to the EJ category in Figure 3. This conclusion is also supported by the non-cancer risk values for these tracts (not shown). More relevantly, these calculations support our assessment that the highest risks from HERC are generally for residents closest to the facility. Again, this contradicts the County's assertion that risks are equal for all parts of Figure 2.

This analysis is also important because most of the census tracts within one or two miles of the HERC are EJ tracts. Showing risk results from 14 EJ tracts and 12 non-EJ tracts (with one likely mislabeled) as the County does can be misleading because it may suggest that almost equal numbers of EJ and non-EJ tracts are found near HERC. However, even a cursory examination of tracts in Figure 2 shows that most tracts near HERC are EJ tracts (tracts in the slides not selected for risk analysis are outlined in light blue). An exception is in the southwest direction from HERC and to a lesser extent to the west. But these non-EJ tracts are still a minority of the tracts near HERC and are also in directions often upwind of HERC based on prevailing wind data and therefore may have lower HERC risks than other nearby tracts in other compass directions.[51]

In summary, our analysis shows that it is likely that risk from HERC generally decreases as one moves farther from the incinerator. HERC has a smokestack and its height is also a factor in pollution dispersion but does not eliminate the basic principle that generally air pollution concentration diminishes over distance, nor contravenes the data we present.[52]

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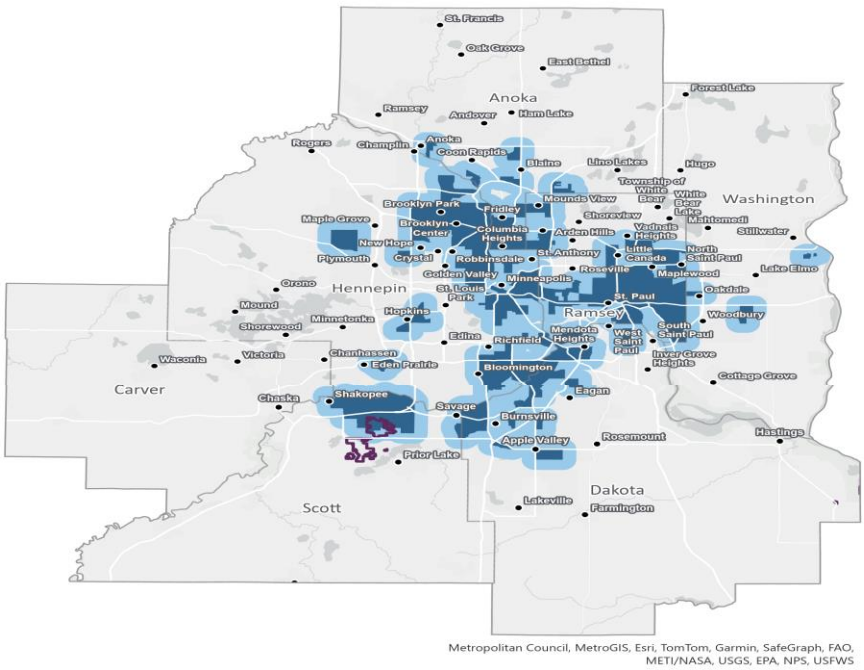
[51] Meteoblue, Windrose diagram, https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/minneapolis_united-states_5037649 . Wind from the northeast would blow HERC pollution toward the non-EJ tracts southeast of HERC, while winds from the east would blow HERC pollution to tracts west of HERC. These are the least common wind directions for Hennepin County.

[52] A note on slide 5 of the newer slideshow mentions that HERC has a tall smokestack, which may be their explanation or support for their claim that risks are equal at different distances from HERC: "Also note that point sources typically have tall "smoke stacks", so the release points for emissions are high in the air, which increases dispersion of those pollutants"

None of the tracts in Figure 2 include parts of the County that are even farther from the HERC, as seen in Figure 4 below. As can be seen by comparing Figure 2 to Figure 4, much of the county's area is not included in tracts used in the County slideshows. However, having established on a preliminary basis that HERC risks diminish substantially by distance, we believe it is likely that these more distant parts of the county are generally exposed to even less risk from it.

Finally, as seen when examining a map of Hennepin County census tracts from 2020, the tracts in Minneapolis including near the HERC are mostly substantially smaller in size than those in parts of the County more distant from HERC.[53] This reflects the generally higher population density of the tracts near HERC in Minneapolis than in more distant parts of the County. This in turn means that relatively more people live close to HERC in EJ communities rather than farther away on a unit of land basis.

Figure 4: Showing Environmental Justice Areas in Hennepin County in Dark Blue as Defined by the Minnesota Polution Control Agency (the light blue areas are mile wide buffer zones)



[53] U.S. 2020 Census Tract Map. https://www2.census.gov/geo/maps/DC2020/PL20/st27_mn/censustract_maps/c27053_hennepin/DC20CT_C27053.pdf

4) Risks from HERC Pollution are Generally Higher for Residents of EJ Communities Even if Outdoor Air Pollution is the Same as in Non-EJ Communities

Contrary to the claims of the slideshow conclusion, even if residents in EJ neighborhoods near HERC were exposed to the same amount of pollution from it and other sources as the non-EJ neighborhoods farther from HERC, the public health outcomes would generally be significantly worse for the EJ neighborhoods. Science literature shows that more people in EJ communities are more susceptible to harm from a given amount of air pollution than in wealthier and whiter communities.[54] This occurs for several reasons. First, people with existing illnesses such as respiratory illnesses, cardiovascular illnesses, and likely others, are more sensitive to the effects of air pollutants than those without such illnesses.[55] There are typically more people who have these illnesses in EJ communities.[56] Second, other social and physical stresses interact with air pollution to increase the harm from a given amount of pollutant, and these stresses are usually more prevalent in EJ communities.[57] Third, even when the amount of pollution from a source such as HERC is the same outside a residence, the amounts from that source are often higher inside EJ residences. This is because there is often greater air permeability in these residences from the outside[58], but also higher income residents are more likely to be able to ameliorate that pollution, e.g. with high quality filtration devices (such as HEPA filters) or central air conditioning. For example, closing windows generally reduces the amount of air pollution that enters a residence, but in hot weather it may be difficult to keep all windows closed without air conditioning or central air conditioning. Central air conditioners can be equipped with filters which can remove substantial amounts of air pollutants such as PM.

One recent major study found that BIPOC people had substantially greater risk of premature death from $PM_{2.5}$ exposure than white people. Black people had about 3 times higher increased risk of premature death than the overall population in the U.S. based on a given amount of pollutant.[59] Low-income people were also found to have elevated risk from $PM_{2.5}$ and ozone.

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[54] Morello-Frosch, R. et al. 2011. Understanding the cumulative impact of inequality in environmental health: Implications for policy. *Health Affairs* 30(5): 879-887 doi:10.1377/hlthaff.2011.0153

[55] Chi, G.C. et al. 2015. Individual and neighborhood socioeconomic status and the association between air pollution and cardiovascular disease. *Environ. Health Perspect*. 124(12): 1840-1847

[56] Morello-Frosch, R. et al. 2011 ibid

[57] Morello-Frosch, R. et al. 2011 ibid

[58] Hystad, P.U. et al. 2009. Modeling residential fine particulate matter infiltration for exposure Assessment. *J Exposure Sci Enviro Epidem* 19: 570–57

[59] Di, Q. et al. 2017. Air Pollution and Mortality in the Medicare Population. *New Eng. J. Med*. DOI: 10.1056/NEJMoa1702747

In other research it was found that women in the most SES (socioeconomic status, an international measure that reflects EJ) disadvantaged neighborhoods had an almost 50% higher risk of serious cardiovascular events from exposure to PM pollution compared to women in the most well-off SES areas.[60]

The risk numbers shown in slides 41-46 in the older slideshow, or those in the additional 26 slides, do not consider or reflect the greater vulnerability and susceptibility of EJ residents in their risk assessments. This is because the MNRisks program used to calculate risks in those slides does not take the greater susceptibility or vulnerability of EJ residents into account. Therefore, the numbers in those slides underestimate the risk to EJ communities in addition to higher exposure to pollutants from HERC and other sources.

5) Additionally, residents of Hennepin County are exposed to air and other pollution from many sources. A cumulative impact assessment recognizes that the harm from all these sources should be, at the least, added to arrive at an overall risk. When that is done, cancer risk exceeds standards by about 2 - 4-fold and non-cancer risks limits are often exceeded as shown in slides 41-46 of the older slideshow and the additional slides we analyzed. However, it is also important to keep in mind that these risks were determined using MNRisks. But MNRisks does not include PM or ozone. If these important criteria pollutants were included, the resulting cumulative risks would be greater. If the more recent regulatory standards of U.S. EPA and WHO were used, as discussed above, pollution emissions would likely exceed acceptable limits by considerably more.[61]

   Considering only the data provided in the slides, the overall average cancer risk (all sources) for NL and the other five nearby tracts from slide 40 is ~3.1-fold higher than the accepted MPCA risk limits while the more distant seven tracts are ~2.5-fold higher. In other words, the overall cancer risk for the tracts closer to HERC is about 24% greater than for the more distant tracts, but without consideration of greater EJ susceptibility and vulnerability. For non-cancer illness, the overall risk for nearby tracts is ~1.0 and from the more distant tracts it is ~0.9, or ~10% higher for the nearby tracts. Overall air pollution risks are higher for the tracts closer to HERC.

6) Important air pollutants produced by HERC are not Included in permits or other risk assessments. For example, we now know from recent research that PFAS is emitted from incinerator smokestacks, even when equipped with modern state of the art

[60] Chi, G.C. et al. 2015. ibid

[61] As noted above the earlier slideshow was produced in early February 2022. The U.S. EPA did not lower its risk standards for PM until 2024. The WHO revised its PM and NO_2 standards in 2021, but it is unlikely that these were used to develop either slideshow.

pollution control equipment.[62] Because HERC pollution risk is several times higher for residents close to HERC, exposure is also higher from emissions of currently unmeasured dangerous pollutants like PFAS or other pollutants which are not often monitored, as well as those we may not be aware of.

Conclusions

The analysis in this report suggests that the ability to reduce or eliminate *any* significant risk source like HERC should be an urgent goal, even if other larger sources remain for the time being. Even without the adjustments that we point to in this report, risk assessment of HERC using an approved EPA method shows that 1-2 people per year would likely die prematurely because of HERC PM pollution.[63] Many more would experience illness short of mortality. The assessment in this report would substantially raise those numbers. That harm should not be acceptable, especially given higher exposure and higher risk in EJ communities. Instead, the County staff turn this on its head and suggest that because overall amounts of air pollutants from non-HERC sources are higher, we should ignore the harm from HERC.[64]

If the often-expressed concern from local and state governments for historically and currently overburdened EJ communities is real, and not merely politically convenient rhetoric, it is imperative based on risk science and ethics to close the HERC as soon as possible. This is especially true because the HERC is not necessary and any benefits from it, such as heat and electricity, can be better supplied by renewable zero carbon means, and waste issues can be better addressed by accelerating adoption of reduction, reuse and recycling which nearly everyone agrees is the best path forward.

[62] Bjorklund, S. et al. 2023. Emission of per- and polyfluoroalkyl substances from a waste-to-energy plant occurrence in ashes, treated process water, and first observation in flue gas. *Environ. Sci. Technol.* 57: 10089−10095

[63] Núñez, Y. et al. 2023. Cumulative burden analysis for zip codes 55407 and 55411. PSE Healthy Energy. Oakland CA. This analysis is itself an underestimate, because it does not include greater susceptibility and vulnerability of EJ communities.

[64] Note however that for some pollutants such as HCl and NO_2 the HERC is the highest or nearly highest source in the County.