Energy Justice Network

www.EnergyJustice.net

...helping communities protect themselves from polluting energy and waste technologies

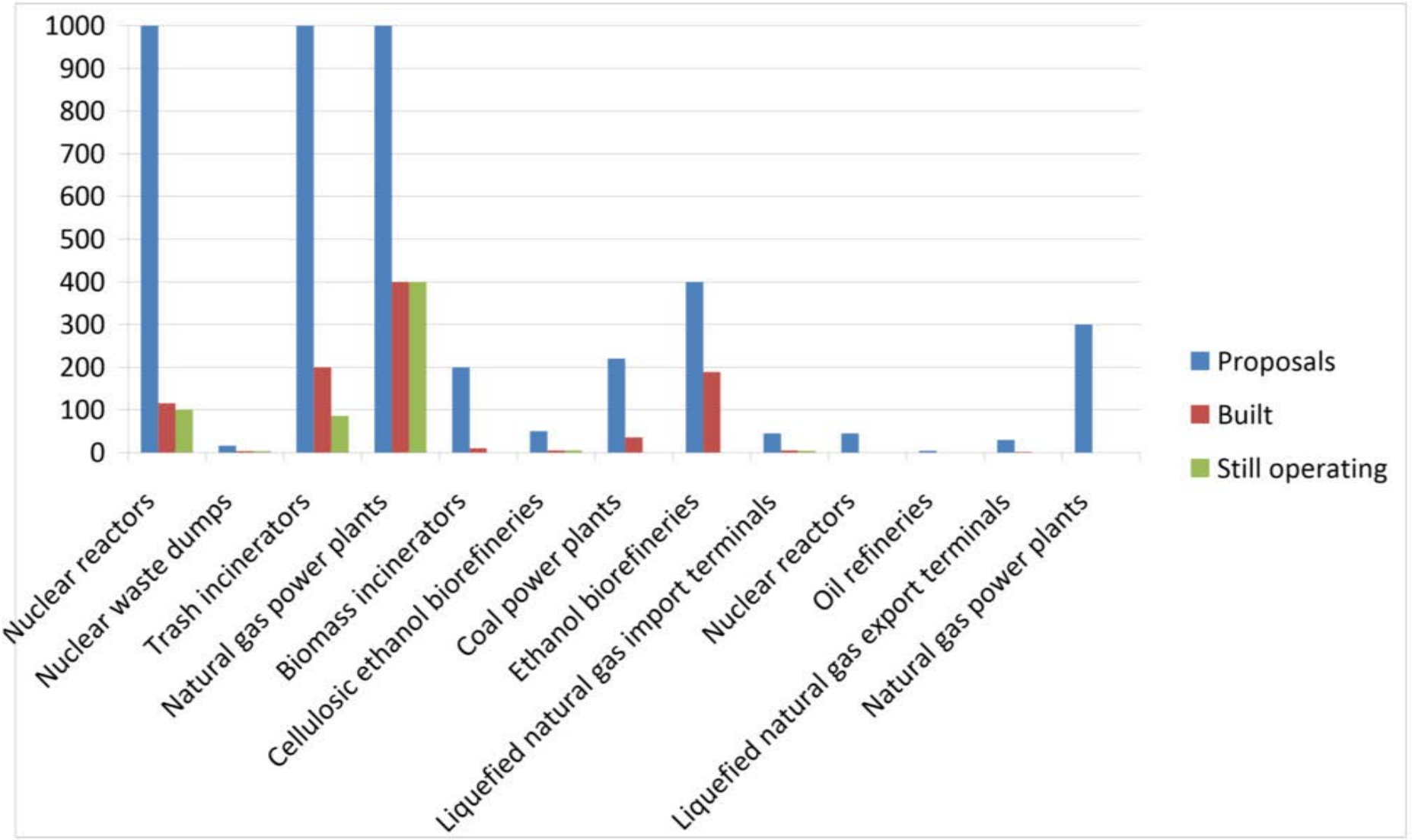
Energy Justice Network

Victories Against Biomass & Waste Incinerators (2010 - 2014)

Victory	City	State	Waste to be burned	Local group
Nov-14	Frederick	Maryland	Trash / Tires / Sewage Sludge	No Incinerator Alliance; Waste Not! Carroll
Oct-14	Bloomington-Normal	Illinois	Trash / Tires	Don't Waste Bloomington-Normal
Sept-14	Allentown	Pennsylvania	Trash / Sewage Sludge	Allentown Residents for Clean Air
Aug-14	Stafford County	Virginia	Trash / Tires	Stop the Stafford Incinerator
Apr-14	Jasper	Indiana	Miscanthus grass	Healthy Dubois County
Apr-14	Port Townsend	Washington	Wood	Port Townsend Airwatchers
Mar-14	North Las Vegas	Nevada	Construction/demolition waste & tires	Citizens of North Las Vegas United
Mar-14	Bristol	Pennsylvania	Hazardous Waste	Ban the Burn in Bristol
Feb-14	North Springfield	Vermont	Wood / Wood Waste	North Springfield Action Group
Feb-14	Minneapolis	Minnesota	Trash (expansion blocked)	Minneapolis Neighbors for Clean Air
Jan-14	White Deer	Pennsylvania	Tires	Tire Burner Team; Organizations United for the Environment / Shale Justice
Jul-13	Transylvania County	North Carolina	Trash / Wood Waste	People for Clean Mountains
Jun-13	Klamath Falls	Oregon	Wood / Wood Waste	Save Our Rural Oregon
Apr-13	Greenfield	Massachusetts	Wood / Wood Waste	Concerned Citizens of Franklin County
Jan-13	Peters Township	Pennsylvania	Crematorium	Peters Township residents
Jul-12	St. Lucie	Florida	Trash	Floridians Against Incinerators in Disguise
Apr-12	Biscoe	North Carolina	Poultry Waste	Blue Ridge Environmental Defense League
Feb-12	Montgomery County	North Carolina	Poultry Waste	Blue Ridge Environmental Defense League
Jan-12	Pichidegua	Chile	Poultry Waste	Comite en defensa del medio ambiente de Pichidegua
Nov-11	Port St. Joe	Florida	Wood / Wood Waste	Gulf Citizens for Renewable Energy
Nov-11	Vancouver	Washington	Wood / Wood Waste	Clark County Clean Air
Oct-11	Milltown	Indiana	Wood / Wood Waste	Concerned Citizens of Crawford County
Jun-11	Hamilton County	Florida	Wood / Wood Waste	Floridians Against Incinerators in Disguise
Jun-11	Valdosta	Georgia	Sewage Sludge / Wood Waste	Valdosta-Lowndes NAACP; Wiregrass Activists for a Clean Environment
May-11	Springfield	Massachusetts	Construction / demolition wood waste	Stop Toxic Incineration in Springfield
May-11	Mecklenburg County	North Carolina	Trash	Central Piedmont Sierra Club; SustainCharlotte
May-11	Attleboro	Massachusetts	Railroad Ties, Utility Poles & Plastics	Attleboro Residents with Important Safety Concerns
Apr-11	Pownal	Vermont	Wood / Wood Waste	Bennington-Berkshire Citizens Coalition
Mar-11	Shelton	Washington	Wood / Wood Waste	Concerned Citizens of Mason County
Mar-11	DeKalb County	Georgia	Wood / Wood Waste	Lithonia residents; Unhappy Taxpayer Voter Association
Feb-11	Somerset	Massachusetts	Coal / Wood Waste	Toxics Action Center; Somerset residents
Dec-10	Olympia	Washington	Wood / Wood Waste	Olympia Rising Tide; No Biomass Burn
Dec-10	Salem	Missouri	Wood / Wood Waste	Concerned Citizens of Perryville
Dec-10	Elbert County	Georgia	Trash / Wood Waste	Citizens for Public Awareness
Nov-10	Shadyside	Ohio	Coal-to-Biomass Conversion	Buckeye Forest Council
Nov-10	Clackamas County	Oregon	Wood / Wood Waste	Redland Community Action Group
Aug-10	Hart County	Georgia	Poultry Waste	Stop Fibrowatt in Northeast Georgia
Aug-10	Sampson County	North Carolina	Poultry Waste	Sampson Citizens for a Safe Environment; NAACP
Jul-10	Scottsburg	Indiana	Wood / Wood Waste	Concerned Citizens of Scott County
Jun-10	Traverse City	Michigan	Wood / Wood Waste (5 proposals defeated)	Michigan Citizens for Energy, the Economy and Environment
May-10	Erie	Pennsylvania	Tires	Keep Erie's Environment Protected
Apr-10	Port St. Joe	Florida	Wood / Wood Waste	Floridians Against Incinerators in Disguise
Apr-10	Elkin	North Carolina	Poultry Waste	Citizens Alliance for a Clean, Healthy Economy
Mar-10	Gretna	Florida	Wood / Wood Waste	Concerned Citizens of Gadsden County
Feb-10	Page County	Virginia	Poultry Waste	Page County Citizens

Grassroots Work Wins

(Most Proposed Energy and Waste Facilities Defeated)



Source: "The Power of Grassroots Resistance to Dirty Energy," www.energyjustice.net/files/grassrootsresistance.pdf

Trash Incineration

www.EnergyJustice.net/incineration/

Energy Justice Network

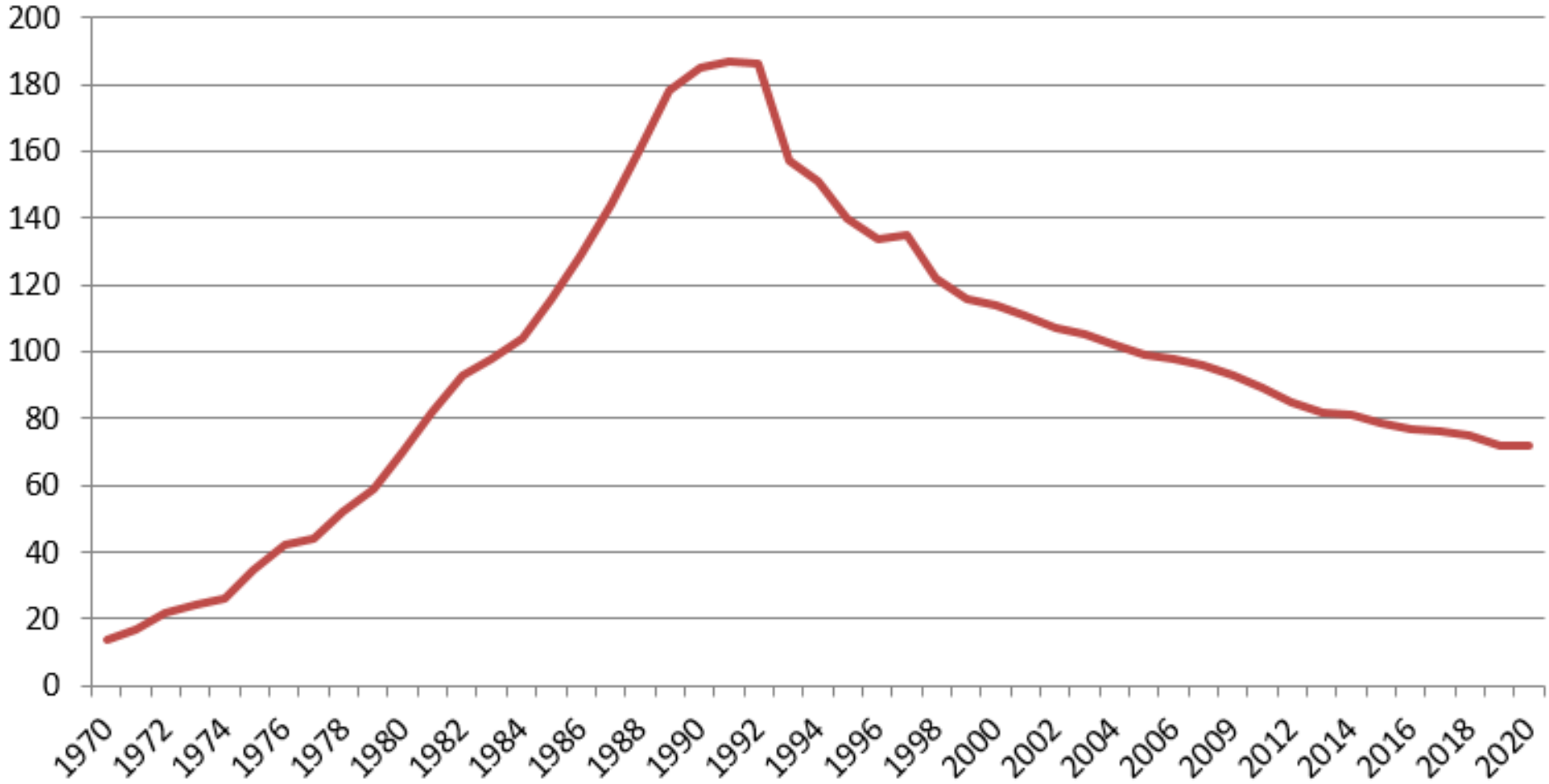
Map BETA

Home | People | Groups | Facilities | Events | Resources | About | Login

National Map

www.EnergyJustice.net/map

Number of Commercial Operating Trash Incinerators in the U.S.



Incinerator Life Spans

- Average life of the 14 trash incinerators closed since 2010 in the U.S.: **26 years**.
- Average lifespan of the 30 trash incinerators that have closed since 2000 was just **22 years**.
- Few trash incinerators operate beyond a 30-year life time.
- Only one made it past 40 without being completely rebuilt, and is having serious problems.
  - Rebuilding the Harrisburg, PA incinerator bankrupted the city.

Incinerator Life Spans

Covanta's newest incinerator was aging at the ripe age of 22. In Maryland…

In 2016-2017, the incinerator experienced more downtime than usual, due to "much-needed plant maintenance." The incinerator's capacity and availability "is below industry standard" and has resulted in "high waste inventories" (larger piles of trash stored inside the plant).

"This reduced availability and capacity is a result of a lack of maintenance and repair on the boiler and air pollution control systems."

Source: Covanta & Montgomery County Department of Environmental Protection. See pp. 4 & 49 in www.montgomerycountymd.gov/SWS/Resources/Files/rrf/RCA%20Documents.pdf

Incinerators: Names Used

- Waste-to-energy (WTE)
- Energy from Waste (EfW)
- Trash-to-steam
- Conversion technologies
- Energy Recovery
- Biomass
- Advanced Thermal Tech
- Waste to Fuel (WTF?)
- Pyrolysis / Gasification / Plasma Arc
- Policy buzzwords: “integrated” or “sustainable materials management”

Incinerators are…

~~Trash-to-Steam~~

Trash to toxic ash and toxic air emissions

Incinerators are…

~~Waste-to-Energy~~

Waste-OF-energy

(3-5 times more energy wasted by not recycling/composting the materials burned)

Source: Morris, Jeffrey, and Canzoneri, Diana, "Recycling Versus Incineration: An Energy Conservation Analysis," Sound Resource Management Group (SRMG) Seattle, Washington, September, 1992.
www.sciencedirect.com/science/article/pii/0304389495001166

World's largest waste corporation driving away from incineration

WASTE MANAGEMENT

THE WALL STREET JOURNAL.

Jan 3, 2014: "Big Waste Hauler Rethinks Startups"

[pulls out of gasification, pyrolysis, plasma and trash-to-ethanol investments, selling off Agilyx, Enerkem, Fulcrum, Genomatica & InEnTec]

Jul 29, 2014: "Waste Management to Sell Wheelabrator for $1.94 Billion"

[pulls out of long-standing ownership of Wheelabrator, the second-largest operator of conventional incinerators in U.S.]

EPA: “Non-Hazardous Secondary Materials” rule
Waste is now “Fuel”

[Refuse-derived fuel (RDF) or “SpecFuel” or “Processed Engineered Fuel”]

Emerging Threats

- **Refuse-derived fuel (RDF)**
  (fuel pellets to burn in coal plants, cement kilns and other boilers)
  - Processed Engineered Fuel
  - SpecFuel

- **Waste to fuels**
  - Trash to ethanol, methanol, jet fuel, naphtha, asphalt…

- **Two-stage incinerators**
  - Pyrolysis
  - Gasification
  - Plasma Arc

- **Anaerobic digestion**
  - Digestated trash marketed as burnable fuel, or as fertilizer or soil amendment; ok if just to pre-process before landfill

Stop Greenwashing:
Hold Crayola Accountable

www.energyjustice.net/crayola

Experimental Types of Incinerators Don't Work

Gasification, plasma arc and pyrolysis:

- **Can't run continuously**
- **Can't be run effectively at commercial scale**
- **Can't process heterogenous feedstocks like trash**
- **Companies with no real history bamboozle local officials into subsidizing projects that fail, technically and financially**
- **The companies usually lie about their emissions, claiming zero emissions or "no smokestack"**

EPA says pyrolysis/gasification = incineration

40 CFR 60.51a:

- **Municipal waste combustor**, MWC, or municipal waste combustor unit: (1) **Means any setting or equipment that combusts solid, liquid, or gasified MSW including, but not limited to**, field-erected incinerators (with or without heat recovery), modular incinerators (starved-air or excess-air), boilers (i.e., steam-generating units), furnaces (whether suspension-fired, grate-fired, mass-fired, air curtain incinerators, or fluidized bed-fired), and **pyrolysis/combustion units**.
- **Pyrolysis/combustion unit** means **a unit that produces gases**, liquids, or solids **through the heating of MSW, and the gases**, liquids, or solids produced **are combusted and emissions vented to the atmosphere**.

"**A municipal waste incinerator** 'combusts' solid waste and thus **is functionally synonymous with municipal waste combustor**."
(www.epa.gov/ttn/nsr/gen/rm_2.html)

Pyrolysis is a failed technology

Patent review company:

- **has been seeing pyrolysis projects for 14 years**
- **none of them are legitimate**
- **they're just splitting combustion into two steps, making it more expensive, less efficient and not any cleaner**
- **sees a steady stream of guys in their 50s-70s who worked at corporations, thought it's a great idea, and go out and promote it and get money by whatever means and get some patent coverage mainly to help get the money, but none are legit**

Pyrolysis is a failed technology

Rubber Manufacturers Association:

- **“Major tire companies like Goodyear and Firestone once invested ‘immense resources’ in pyrolysis but could not find markets for the byproducts or even a way to integrate them into their own products. And scores of start-ups have tried and failed to make money from tire pyrolysis.”**
- **“The road is littered with the carnage of people who were trying to make this technology viable.”**

Pyrolysis is a failed technology

- **Not intended for continuous operation**
  - **Runs batch processes**
  - **Mainly used at demonstration scale**
- **Can only operate on homogenous fuels**

Environmental Protection Agency:

- **While technically feasible, tire pyrolysis – a process in which tires are subjected to heat in an oxygen-starved environment and converted to gas, oil and carbon char – has been inhibited by the high capital investment required and steep operating costs**

Technologies and Risk

Source: Gershman, Brickner & Bratton, Inc. August 2012

Alternative	Risks/Liability	Risk Summary
Mass Burn/WaterWall	Proven commercial technology	Very Low
Mass Burn/Modular	Proven commercial technology	Low
RDF/ Dedicated Boiler	Proven commercial technology	Low
RDF/Fluid Bed	Proven technology; limited U.S. commercial experience	Moderate to Low
Anaerobic Digestion	Proven technology; limited U.S. commercial experience	Moderate to Low
Mixed-Waste Composting	Previous large failures; No large-scale commercially viable plants in operation; subject to scale-up issues	Moderate to high
Pyrolysis	Previous failures at scale, uncertain commercial potential; no operating experience with large - scale operations	High
Gasification	Limited operating experience at only small scale; subject to scale-up issues	High
Chemical Decomposition/ Depolymerization	Technology under development; not a commercial option at this time	High

Basic Lessons

- Garbage-in, Garbage-out.
- Nothing is 100%.
- Small amounts matter, especially if they're a small % of a BIG number.
- If incineration is the answer, someone asked the wrong question
- Makes the problem “invisible” rather than making it very visible so that unsustainably-produced products can be properly dealt with

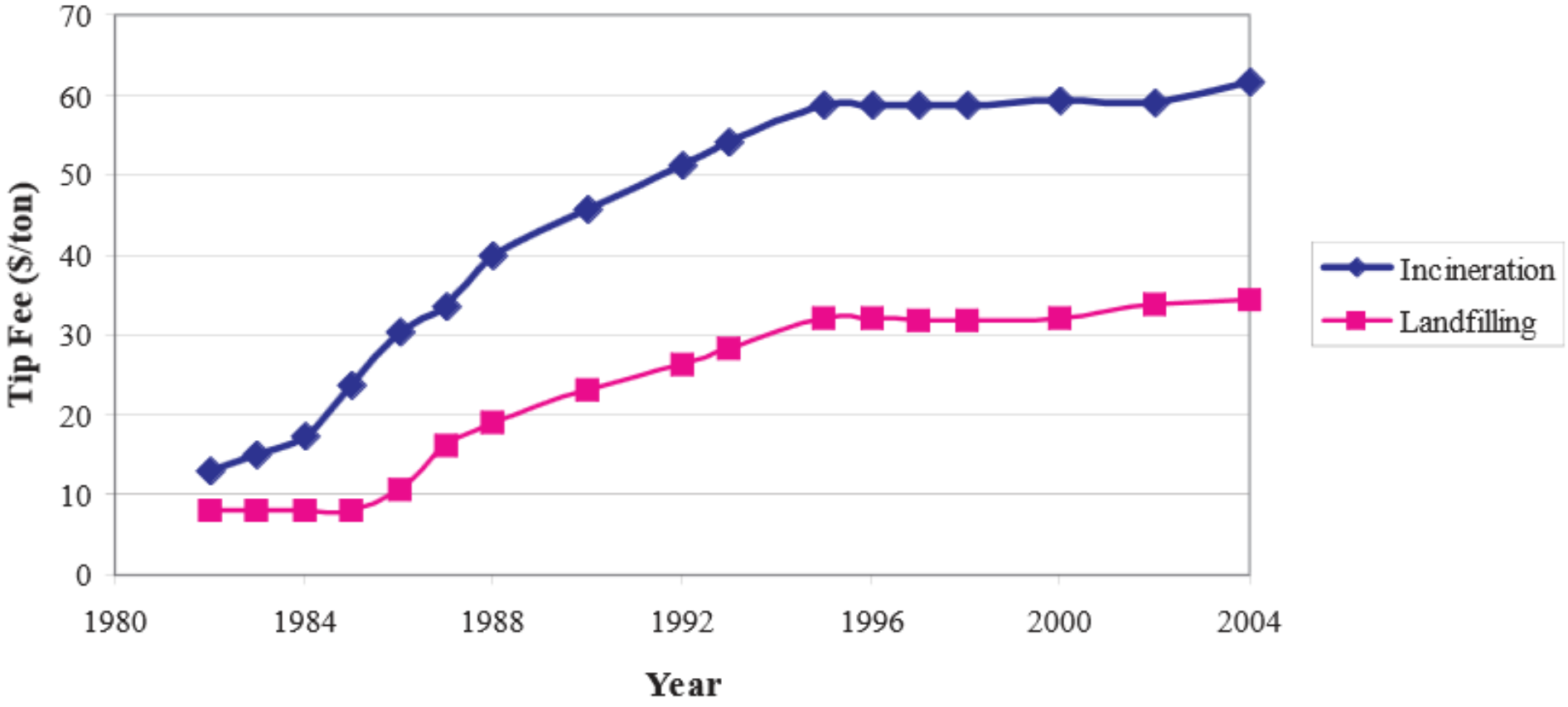
Most Expensive Way to Manage Waste

"**Waste-to-energy is an additional capital cost. That is not in dispute, compared to a landfill... compared to a landfill, which is a less capital-intense structure – it is more expensive. If you had a landfill next to a waste-to-energy facility, then almost in every case, you would think the landfill is going to be cheaper.**"

Ted Michaels, President, Energy Recovery Council, March 18, 2013 testimony before Washington, DC City Council

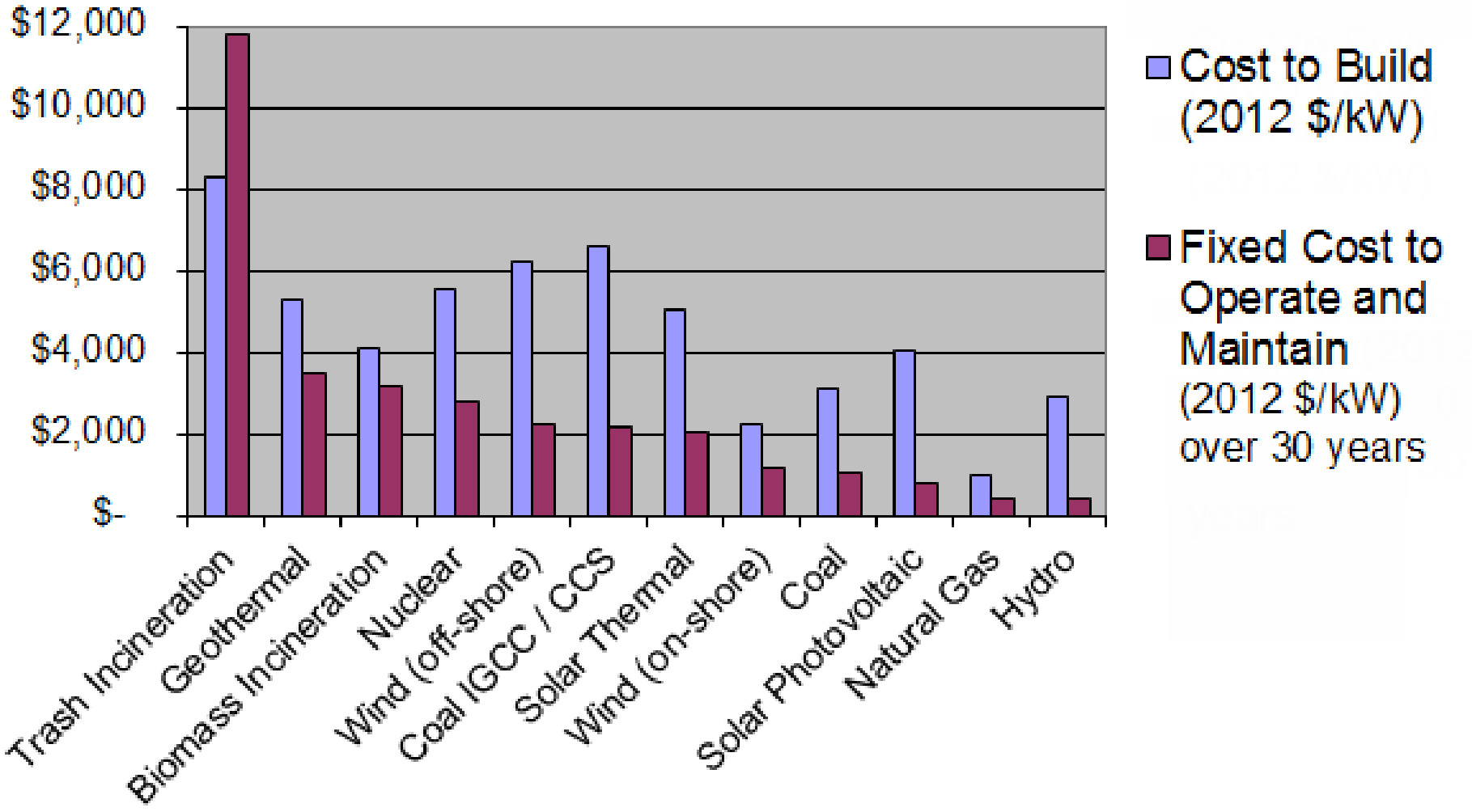
Most Expensive Way to Manage Waste

Figure 3. Landfill and Incinerator Tip Fees



Source: National Solid Waste Management Association 2005 Tip Fee Survey, p4.
www.environmentalistseveryday.org/docs/Tipping-Fee-Bulletin-2005.pdf

Most Expensive Way to Make Energy



Source: "Updated Capital Cost Estimates for Utility Scale Electricity Generating Plants," Energy Information Administration, April 2013, p.6, Table 1. Full report here: www.eia.gov/forecasts/capitalcost/pdf/updated_capcost.pdf

Incinerator Economics

- Capital Intensive (Expensive)
- Requires long-term monopoly contracts "Put-or-Pay" contracts including “put or pay” clauses that punish local governments if they recycle / compost
- Competes with zero waste AND energy alternatives
  - Competes with wind and solar in Renewable Portfolio Standards*
- Economic incentives encourage burning more dangerous wastes (getting paid to take waste vs. paying for fuels)
- Can’t compete with cheap electricity. Steam sales more lucrative.

* Currently, trash incineration is only in direct competition with wind and solar in Maryland’s RPS law, but this affects many other states, and biomass incineration and landfill gas burning competes directly with wind and solar in most RPS laws.

Maryland ratepayer money to trash incinerators via Renewable Energy Credits

(Incineration promoted to Tier 1 – equal to wind – in 2011.)

$20,000,000
$18,000,000
$16,000,000
$14,000,000
$12,000,000
$10,000,000
$8,000,000
$6,000,000
$4,000,000
$2,000,000
$0

2008 2009 2010 2011 2012 2013 2014 2015 2016

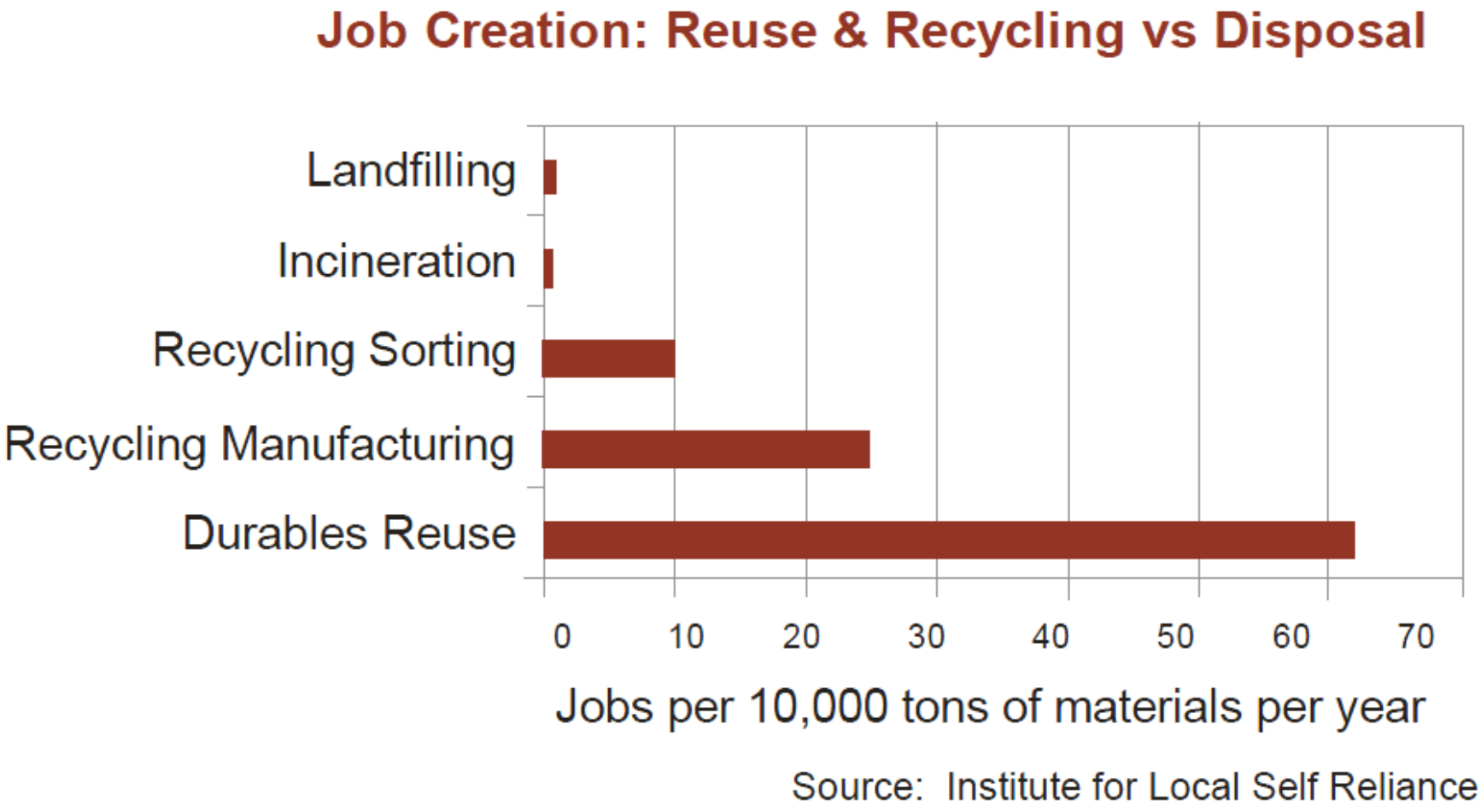
Incineration Competes with ~~Recycling~~ Composting

- **OLD THOUGHT: needs paper and plastics to burn effectively**
- **NEW UNDERSTANDING: competes more with composting**
- **Must be fed enough waste**
- **“Put or pay” waste contracts punish zero waste efforts**

Incinerators Burn Money

- Harrisburg, PA: incinerator was primarily responsible for bankrupting Pennsylvania's capital city
- Claremont, NH: 20-year "put-or-pay" contracts caused 29 towns to file for bankruptcy in 1993, which the court denied, requiring that taxes be raised to pay back the incinerator for waste the towns did not even produce
- Hudson Falls, NY and Lake County, FL – deep incinerator debt due to long-term contracts favorable to the industry
- Poughkeepsie, NY – incinerator fails to bring in enough revenue from tipping fees and electric sales to operate without millions in annual subsidies from the county
- Detroit, MI – the nation's largest incinerators by design capacity – has cost the ailing city $1.2 billion in debt payments over 20 years, bringing the city close to bankruptcy on three occasions.
- All of New Jersey's five trash incinerators had to be bailed out by the state taxpayers with over $1.5 Billion because they could not attract enough waste to operate at capacity.

Worst Way to Create Jobs



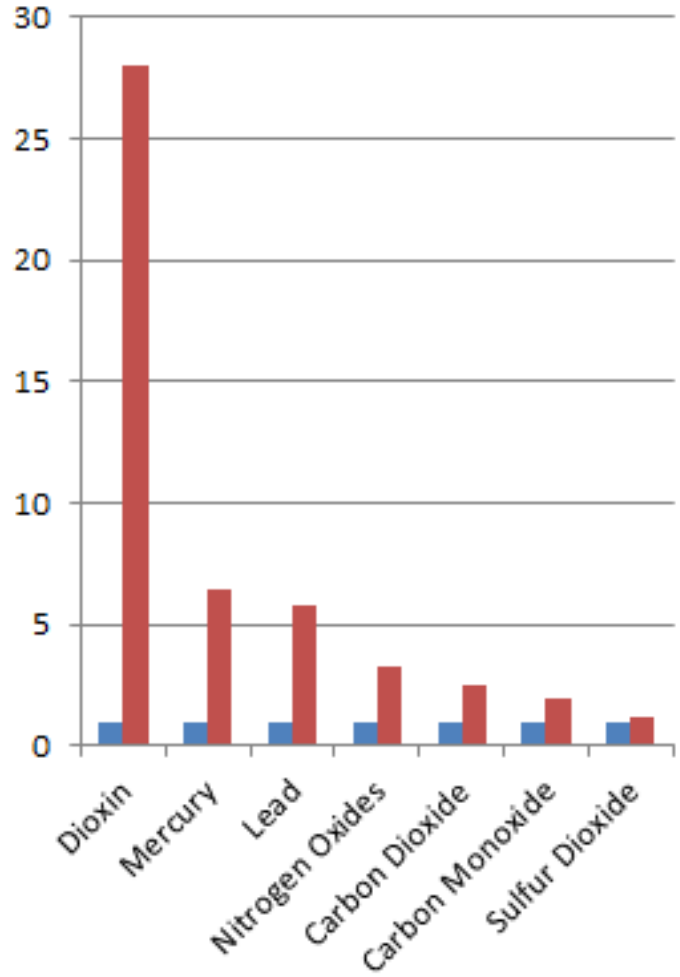
Job Creation: Reuse & Recycling Versus Disposal in the United States

Type of Operation	Jobs Per 10,000 Tons per Year
Product Reuse	
Computer Reuse	296
Textile Reclamation	85
Misc. Durables Reuse	62
Wooden Pallet Repair	28
Recycling-Based Manufacturers	25
Paper Mills	18
Glass Product Manufacturers	26
Plastic Product Manufacturers	93
Conventional MRFs[101]	10
Composting	4
Incineration	1
Landfilling	1

Incineration Worse than Coal

Toxic Air Emissions are…

- **Dioxins / furans** (28 times)
- **Mercury** (6-14 times)
- **Lead** (6 times)
- **Nitrogen Oxides** (NOx) (3.2 times)
- **Carbon Monoxide** (CO) (1.9 times)
- **Sulfur Dioxide** (SO_2) (70% worse)
- **Carbon Dioxide** (CO_2) (2.5 times)



www.energyjustice.net/incineration/worsethancoal

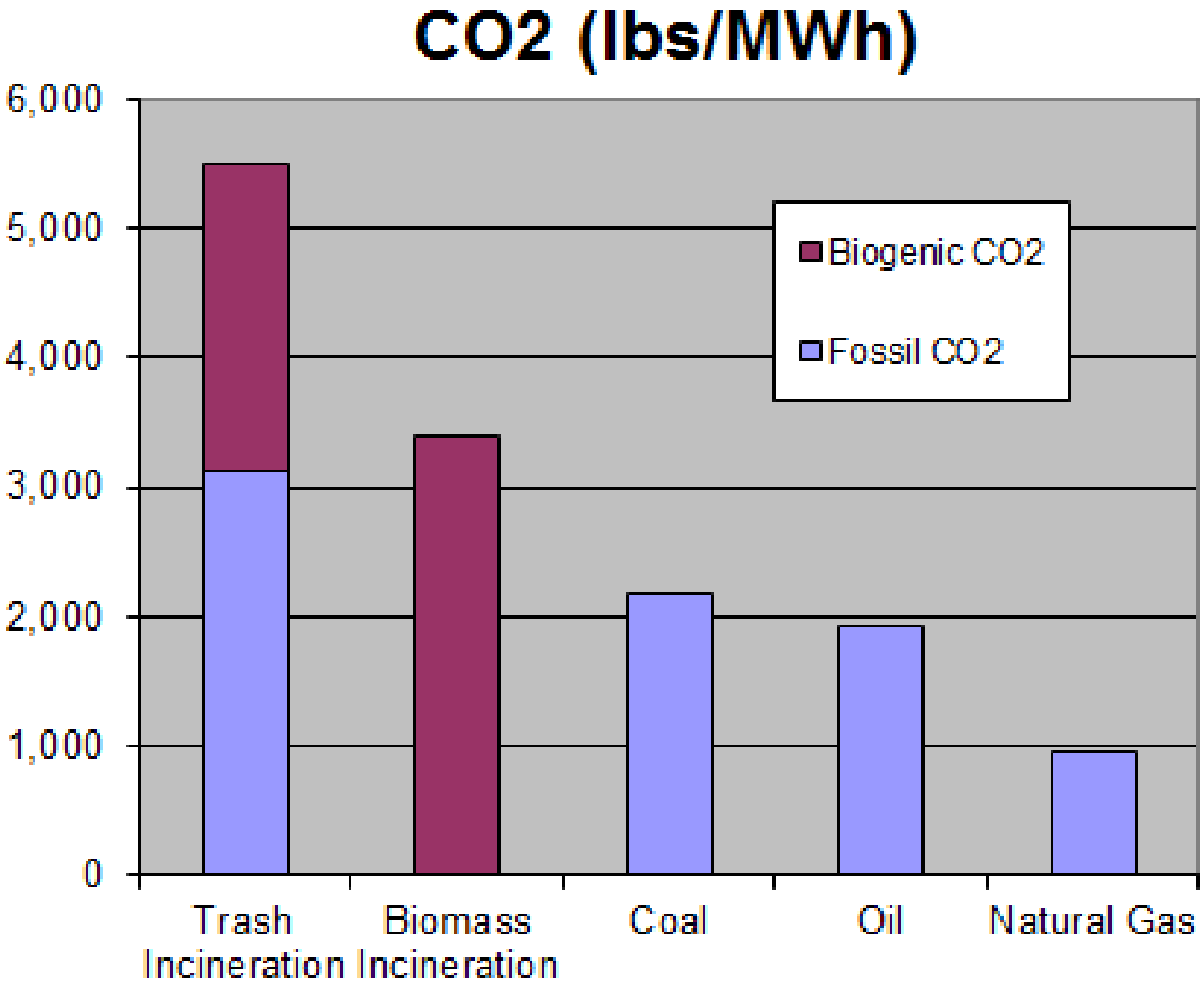
Incinerator, Not a Power Plant

“a waste-to-energy plant is designed to manage solid waste... the electricity output is a secondary function”

Ted Michaels, President, Energy Recovery Council, March 18, 2013 testimony before Washington, DC City Council

Global Warming Pollution

Smokestack CO2 Emissions from U.S. Power Plants



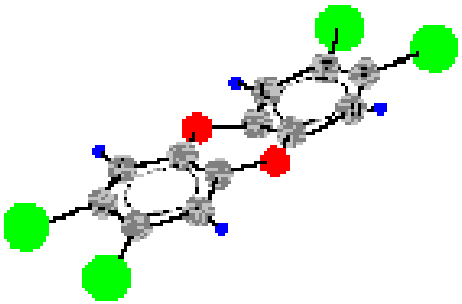
Data is in pounds of CO2 per unit of energy produced (lbs/MWh)

Source: U.S. EPA Emissions & Generation Resource Integrated Database (eGRID) v.9, released 2/24/2014 (2010 data)

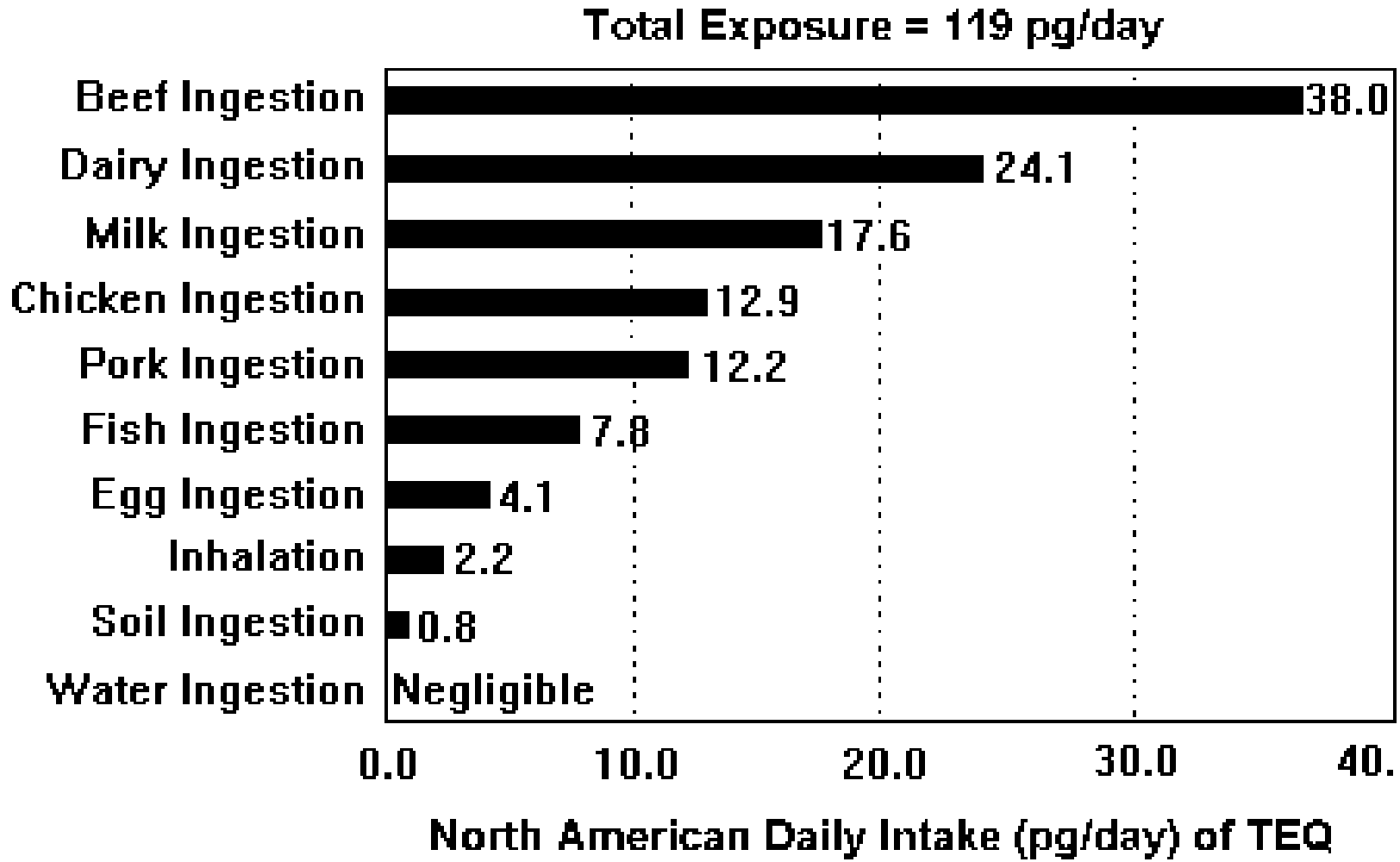
Dioxins & Furans

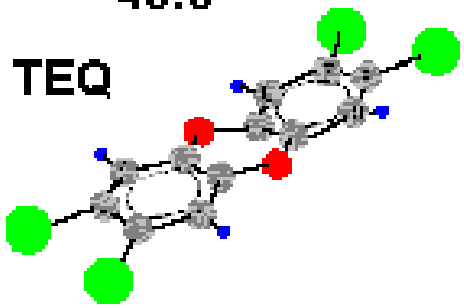
- Most toxic chemicals known to science: 140,000 times more toxic than mercury.
- Cause infertility, learning disabilities, endometriosis, birth defects, sexual reproductive disorders, damage to the immune system, cancer and more.
- 93% of dioxin exposure is from eating meat and dairy products.
  - It takes 14 years for a human to inhale as much dioxin as a grazing cow will ingest in one day.
  - Highest exposure is during infancy.

www.ejnet.org/dioxin/



Exposure to Dioxins

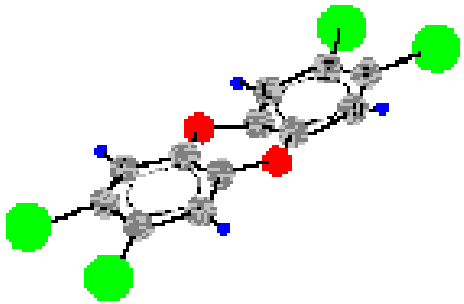




Source: U.S. Environmental Protection Agency, "Estimating Exposure to Dioxin-Like Compounds – Volume 1: Executive Summary," June 1994.

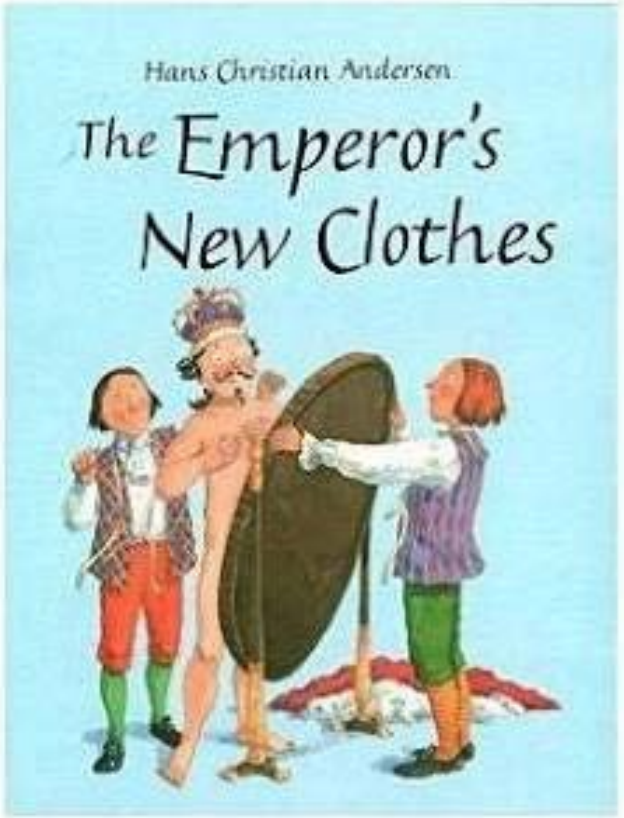
How to make dioxin

- Dioxins are created by burning hydrocarbons with chlorine in the presence of oxygen.
- Dioxin emissions increase when:
  - More chlorine is in the fuel/waste stream
  - Certain metal catalysts are present (Copper, Iron, Zinc…)
  - The gases stay in a low temperature range (200-450^{o} C)
  - Much is formed on the ash as it cools.
  - Carbon injection used to reduce dioxin air emissions increases dioxins, but transfers them to the ash.



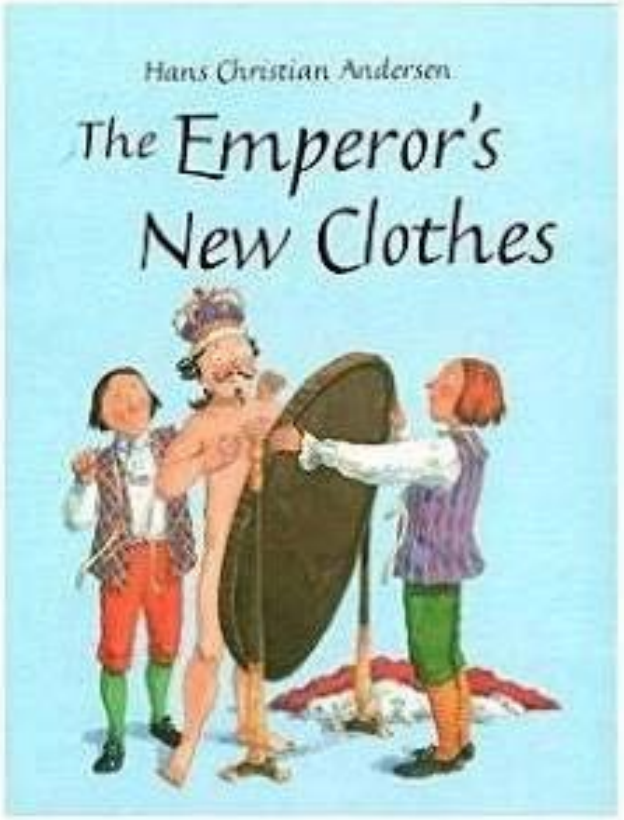
The Smokestack Story

- Continuous Emissions Monitors (CEMs) tell all
- Rigorous enforcement by the state
- Emissions limits = health & safety



The Smokestack Story

- Continuous Emissions Monitors (CEMs) tell all
  - CEMs only cover a few pollutants; others tested annually
  - Some companies rig stack tests and CEMs data
- Rigorous enforcement by the state
  - Not all violations result in fines
  - Fines not enough to change behavior
- Emissions limits = health & safety
  - Not based on health & safety at all
  - Technology-based standard
  - Concentration-based limits mean larger facilities can polluter more



Continuous Emissions Monitors

www.ejnet.org/toxics/cems

Continuous Emissions Monitors

- Only generally used for 3 pollutants: sulfur oxides (SOx), nitrogen oxides (NOx) and carbon monoxide (CO) plus opacity, oxygen and temperature
- Actual emissions of dioxins 30-50 times higher
- Technology now exists to continuously monitor:

Ammonia (NH_4)

Carbon Dioxide (CO_2)

Hydrogen Sulfide (H_2S)

Acid Gases:
- Sulfuric Acid (H_2SO_4)
- Hydrofluoric Acid (HF)
- Hydrochloric Acid (HCl)

Products of Incomplete Combustion (PICs):
- Dioxins & Furans
- Polycyclic Aromatic Hydrocarbons (PAHs)
- Volatile Organic Compounds (VOCs)

Particulate Matter (PM)

Metals:
- Antimony (Sb)
- Arsenic (As)
- Barium (Ba)
- Cadmium (Cd)
- Chromium (Cr)
- Lead (Pb)
- Manganese (Mn)
- Mercury (Hg)
- Silver (Ag)
- Nickel (Ni)
- Zinc (Zn)
- …and more

www.ejnet.org/toxics/cems

Incinerator Ash

- Incinerators still require landfills for their toxic ash
- 30 tons of ash produced for every 100 tons burned
- Ash leaches more readily, can blow off of trucks, and off of landfills where it’s often used as cover

MDE

MARYLAND DEPARTMENT OF THE ENVIRONMENT
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Martin O'Malley
Governor

Anthony G. Brown
Lieutenant Governor

Shari T. Wilson
Secretary

Robert M. Summers, Ph.D.
Deputy Secretary

June 30, 2010

CERTIFIED MAIL
Return Receipt Requested

Mr. Mark S. Wick, Chief
Solid Waste Environmental and Routine Services Division
Department of Public Works
Bureau of Solid Waste
1000 Abel Wolman Municipal Building
Baltimore MD 21202

Dear Mr. Wick:

This is in reference to your Proposed Corrective Action Plan submitted to the Maryland Department of the Environment's (the "Department") Solid Waste Program on June 24, 2010 regarding the Quarantine Road Municipal Landfill located at 6100 Quarantine Road in Baltimore City. The Department has reviewed your submittal and recognizes some of the challenges that are inherent in maintaining compliance at the Quarantine Road Municipal Landfill (the "Facility"). We understand that considerable efforts have been made to address the problems with the leachate collection system and we particularly acknowledge the work that your Engineer, Mr. Vivaldi Nguyen, has performed. The Department offers the following comments on your submitted Proposed Corrective Action Plan:

Incinerator Ash: We are concerned about the use of ash as an Alternative Daily Cover Material (ADCM) or as a fluff layer against the liner system. The ADCM approval given to the City on November 15, 2002 specified that the approval may be suspended or revoked should nuisances, pollution, or other risks to the public health, safety or comfort develop as a consequence of the activity. We have documented ash outside of the lined areas of the cells and excessive dust on the perimeter road. We have also documented during a recent site inspection large pieces of metal in the ash placed right on top of the drainage layer above the liner. Many of these metal pieces were of a sufficient size to potentially damage the liner and contribute to future groundwater degradation. Use of this ash as a fluff layer is unacceptable and must stop within thirty (30) days following receipt of this letter. In addition, the Department finds that use of the ash as an ADCM is not as safe as or better than use of clean soil as required in the regulations. Therefore, the Department revokes authorization previously given to the City to use incinerator ash as an ADCM. The City again will have thirty (30) days following receipt of this letter to discontinue the use of the ash.

Operations Manual: Unfortunately, our recent inspection discovered the very serious problem that unacceptable materials may be compromising the liner system. This and other violations lead to the issuance of another Site Complaint (SC-O-11-SW-002); such improper care regarding the drainage and select waste layers does not instill confidence in the management of the operations at the landfill.

We note that your Compliance Action Plan did address "inadequate cover" or "exposed wastes". Our recent inspection shows that these are still unabated violations and have been a perennial problem. Wastes sitting uncovered on the surface of the landfill can easily become airborne and therefore also affect the litter control issue. Landfill personnel have related that wastes become exposed as the ash washes or is blown away; if this is a valid causative factor, then it's another reason why ash should not be used as an ADCM.

Incinerator Ash = Hazardous Waste

Incinerator ash is toxic, but the U.S. EPA allows a special test that enables it to test as non-hazardous, saving the industry a lot of money

Despite Canada relying on the same test, Vancouver's incinerator ash is leaching toxic cadmium at levels about twice the province's acceptable limits. They've had to ship the hazardous ash to a hazardous waste landfill in Alberta.

How Incinerator Ash Escapes being Hazardous Waste

City of Chicago v. Environmental Defense Fund, 511 U.S. 328 (1994).

May 2, 1994: U.S. Supreme Court rules that incinerator ash which tests hazardous for toxic heavy metals such as lead and cadmium must be disposed of in hazardous waste landfills rather than in municipal solid waste landfills.

If incinerators were made to pay for the expense of disposing of their ash as hazardous waste, they'd be out of business overnight.

How Incinerator Ash Escapes being Hazardous Waste

1) **Switching the test.** EPA allowed the industry to switch from the EP Tox test to the TCLP test.
    - EP Tox Test used to find fly ash hazardous 94% percent of the time, bottom ash 36% of the time, and combined ash 40% of the time
    - Toxicity Characteristic Leaching Procedure (TCLP) test uses different pH requirements that allow the test to be conducted at a neutral pH where lead doesn't leach out, saving the industry from a hazardous waste designation. Lead and cadmium were the leading causes of ash failing the EP Tox test.
    - Neither test looks at what's in the ash. They look just at what leaches out under short-term pH-manipulated lab conditions.

How Incinerator Ash Escapes being Hazardous Waste

2) **Mixing of fly ash and bottom ash prior to testing.**

- Dilutes the toxicity of the fly ash.
- Lime injection in scrubbers (air pollution controls) makes the ash very basic (around pH 12), where lead will leach if tested with water, but the TCLP test uses acid to lower the pH just enough so that lead won't leach – but not to the fixed pH of 5 that the EP Tox test required, where lead leaches again.
- Mixing of the ash prior to testing enables the lime in the fly ash to also protect the bottom ash from failing the test.
- Most of the metals have a U-shaped solubility curve (so it leaches at high and low pH, but not so much in the middle, at a neutral pH). The test can make it look like certain metals won't leach out, though in real-life disposal conditions, over time, the shifting pH will cause it to leach.

How Incinerator Ash Escapes being Hazardous Waste

3) **Allowing incinerators to store ash on-site for months so they can keep treating or diluting it until it passes the test.** Some incinerators have been known to send many ash samples to a lab until one passes, then they use the good results to report to the state.

- One trick used by incinerator operators to pass the TCLP test is to treat the fly ash with phosphoric acid prior to testing. Phosphoric acid converts the soluble lead into the highly insoluble substance lead phosphate, fixing the lead in the ash long enough to pass the test. However, lead phosphate may not tie up lead indefinitely in the landfill, since phosphate is a nutrient for all living things, including microorganisms.

4) **Incinerator ash only has to be tested 4 times a year.** The waste stream is highly variable and ash composition can change frequently.

Incineration Worse than Landfills

- Incinerators still require landfills for their toxic ash
- Choice is NOT landfill vs. incinerator, but:

landfill

vs.

incinerator *AND* a smaller, more toxic landfill

Incineration Worse than Landfills

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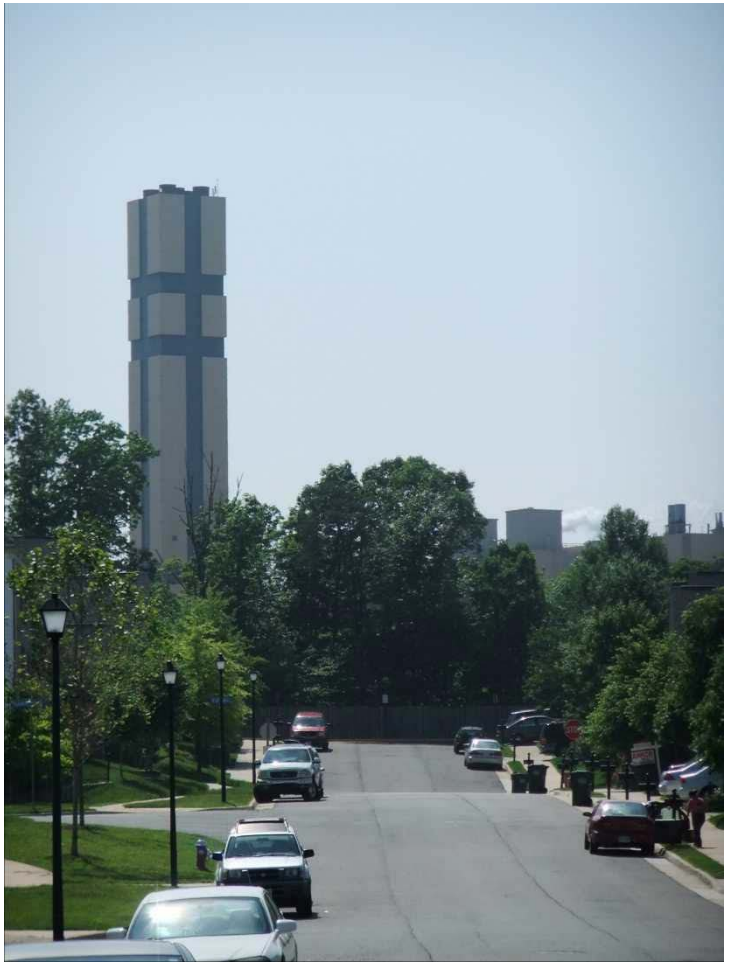
OR…

Zero Waste and minimal landfilling

Landfilling vs. Incineration

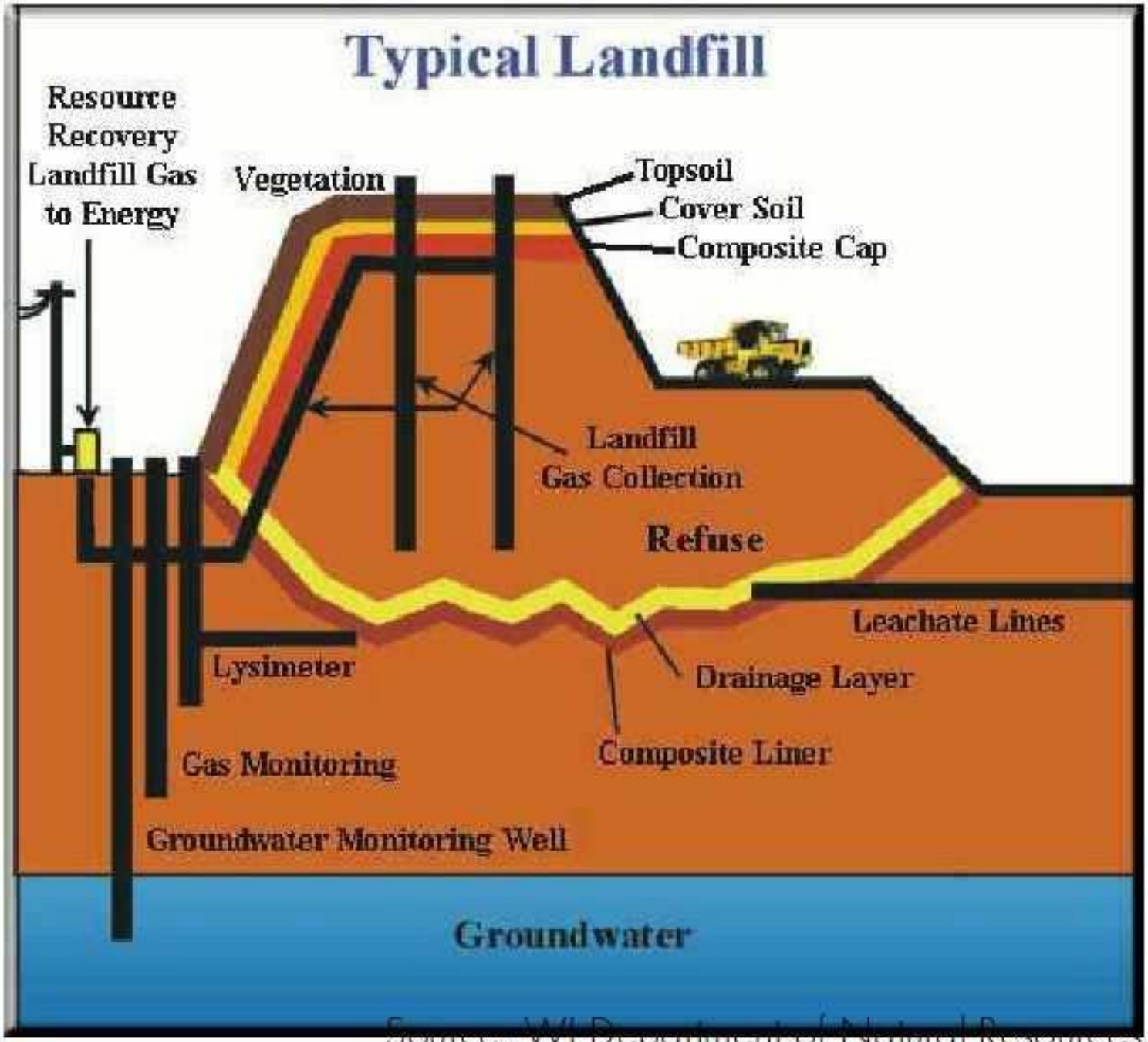


Landfilling vs. Incineration

…and Ash Landfilling

Landfills and Landfill Gas Burning

www.energyjustice.net/lfg/



Source: WI Department of Natural Resources

All Landfills Leak

- U.S. EPA acknowledges that all landfill liners leak within 20 years, if not sooner
- Landfill liners are only guaranteed for about 20 years
- Landfills are permitted to leak a certain amount of gallons/acre
- It's easy not to find leakage (underground or in air); testing is often inadequate

Landfill Gas: What it is…

- Not simply “methane”
- About half methane, half CO_2
- Organics breaking down create the methane; methane helps the toxic chemicals escape
- Hundreds of toxic contaminants
  - Halogenated compounds (trichloroethane, vinyl chloride, carbon tetrachloride and many more)
  - Mercury (methylmercury – the really bad kind)
  - Sulfur compounds (the stinky stuff)
  - Tritium (radioactive)
  - Other toxic organic compounds (benzene , toluene…)

1 -butanol	2,6-dimethylheptane	4-methyl-2-pentanol + branched C-8 paraffin	butanol isomer?
1 -chloro-1 -fluoroethane	2-butanethiol	acetaldehyde	butyl hexanoate
1 -chloro-1 -propene	2-butanol	acetone	butylcyclohexane
1 -chloropropane	2-chloropropane	acetone + ethanol	butylene
1 -heptene	2-ethylfuran	alpha thujene	butylpropanoate
1 -octene	2-ethylhexyl alcohol	alpha-pinene	C-1 0 olefin
1 -pentene	2-ethyl-l-hexanol	alpha-thugene	C-1 1 diene
1 -propanol	2-methyidecalin	alpha-thujene	C-1 1 olefin
1, 1 -dichloroethane	2-methyl heptane	alpha-thujene + branched C-10 paraffin	C-1 1 paraffin
1, 1, 1 -trichloroethylene	2-methyl propanoate	benzene	C-1 1 paraffin + C-3 benzene
1, 1,2,3-tetramethyl-cyclohexane	2-methyl-2-propanethiol	benzothiazole	C-1 I cylcoparaffin
1,1,3-trimethylcyclohexane	2-methyl-3-pentanone + pentanol isomer	beta-pinene	C-10 diene
1,1-dichloroethane	2-methylbutane	branched C-1 1 olefin	C-10 olefin
1,1-dimethyl-cyclopropane	2-methyl-butane	branched C-1 1 olefin & paraffin + C-1 2 diene	C-12 diene
1,2,3-trimethylcyclohexane	2-methyl-ethyl butanoate	branched C-1 1 olefin + branched C-1 2 olefin	C-3 alkylcyclohexane isomer
1,2,3-trimethylcyclohexane isomer	2-methylfuran	branched C-1 1 paraffin	C-3 alkyl-substituted cyclopentadiene isomer
1,2-dichloroethene	2-methylheptane	branched C-1 I paraffin	C-3 benzene
1,2-dichloroethylene	2-methylhexane	branched C-10 olefin	C-3 benzene + branched C-1 1 paraffin
1,2-dichloropropane	2-methylhexylbutyrate	branched C-10 olefin + branched C-1 1 paraffin	C-3 benzene + branched C-10 olefin + paraffin
1,3,5-trimethylcyclohexane	2-methyl-l-propanol	branched C-10 olefin + C3-benzene, …	C-3 benzene + branched C-10 paraffin
1,3,5-trimethylcyclohexane isomer	2-methyloctahydropentalene	branched C-10 paraffin	C-3 benzene + C-1 1 paraffin
1,3-dichloro-2-butene	2-methylpentane	branched C-10 paraffin + 2-methylhexylbutanoate	C-3 benzene + C-10 paraffin
1,5-cyclooctadiene	2-methylthiobutane	branched C-10 paraffin + beta-pinene	C-3 benzene + C-9 diene
1-butanol	2-methylthiopropane	branched C-10 paraffin + branched C-10 olefin	C-3 benzene + octahydro-2-methylpentalene
1-butanol + 1,2-dichloropropane	2-pentanone + 1,2-dichloropropane	branched C-10 paraffin + phellandrene	C-3 benzene isomer
1-chloropropane	2-pentene	branched C-12 diene	C-3 cyclohexane

Landfill Health Impacts

A New York study of 38 landfills found that women living near solid waste landfills where gas is escaping have a four-fold increased chance of bladder cancer or leukemia.

"Investigation of Cancer Incidence and Residence Near 38 Landfills With Soil Gas Migration Conditions, New York State, 1980-1989," State of New York Department of Health, (Atlanta, Ga: Agency for Toxic Substances and Disease Registry, June, 1998).

Landfilling vs. Incineration

Pollutant (all data in tons)	Incinerators	Landfills	Incinerators are __ times as polluting
Greenhouse Gases (CO_2e)	482,770	268,763	1.8
Health Damaging Pollution	1,975	1,236	1.6
Carbon Monoxide (CO)	119	22	5
Hydrochloric Acid (HCl)	17	1	21
Nitrogen Oxides (NOx)	625	6	105
Particulate Matter (Condensable)	25	1	17
Particulate Matter (PM10)	26	17	1.6
Fine Particulate Matter (PM2.5)	17	4	5
Sulfur Oxides (SOx)	55	3	19
Total Suspended Particulate	2,178	2,486	0.88
Volatile Organic Compounds	3	9	0.34

Source: PA Dept of Environmental Protection Air Emissions Report, 2017 data for southeast & southcentral region facilities

How to Compare?

- **Human health impacts**
  - **Nitrogen Oxide emissions (asthma)**
  - **Particulate emissions**
  - **Toxic and Cancer-causing emissions**
- **Eutrophication**
- **Acidification (acid rain…)**
- **Ecosystem toxicity**
- **Ozone depletion**
- **Smog formation**
- **Global warming**

Should also look at…

- **Cost**
- **Jobs**
- **Population impacted**
- **Environmental justice**

Life Cycle Analysis on DC Waste Options

Analysis done by:

Jeffrey Morris, Ph.D. (Economics)

Sound Resource Management Group

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Dr. Morris authored several peer reviewed published studies on waste systems.

LCA Characteristics of WARM, MSW DST and MEBCalc

	LCA Model		
Features	**WARM**	**MSW DST**	**MEBCalc**
Impacts included in model			
-Climate change	✔	✔	✔
-Human health (respiratory)		limited	✔
-Human health (toxic chemicals)		limited	✔
-Human health (carcinogens)		limited	✔
-Eutrophication		limited	✔
-Acidification		limited	✔
-Eco-toxicity		limited	✔
-Ozone depletion			✔
-Smog formation		limited	✔
Monetized Environmental Score			✔
Energy Impacts Included	✔	✔	limited
# of MSW Materials Included	54	~30	27

Additional Comparison of WARM & MSW DST: H. Scott Matthews (Carnegie Mellon University), Cynthia J. Manson (Industrial Economics, Inc.), *Comparative Analysis of EPA Life Cycle Models: Differences between MSW-DST and WARM in Examining Waste Management Options*, prepared for EPA Office of Resource Conservation and Recovery, Internal Review Draft-Do Not Distribute, 11-12-2009.

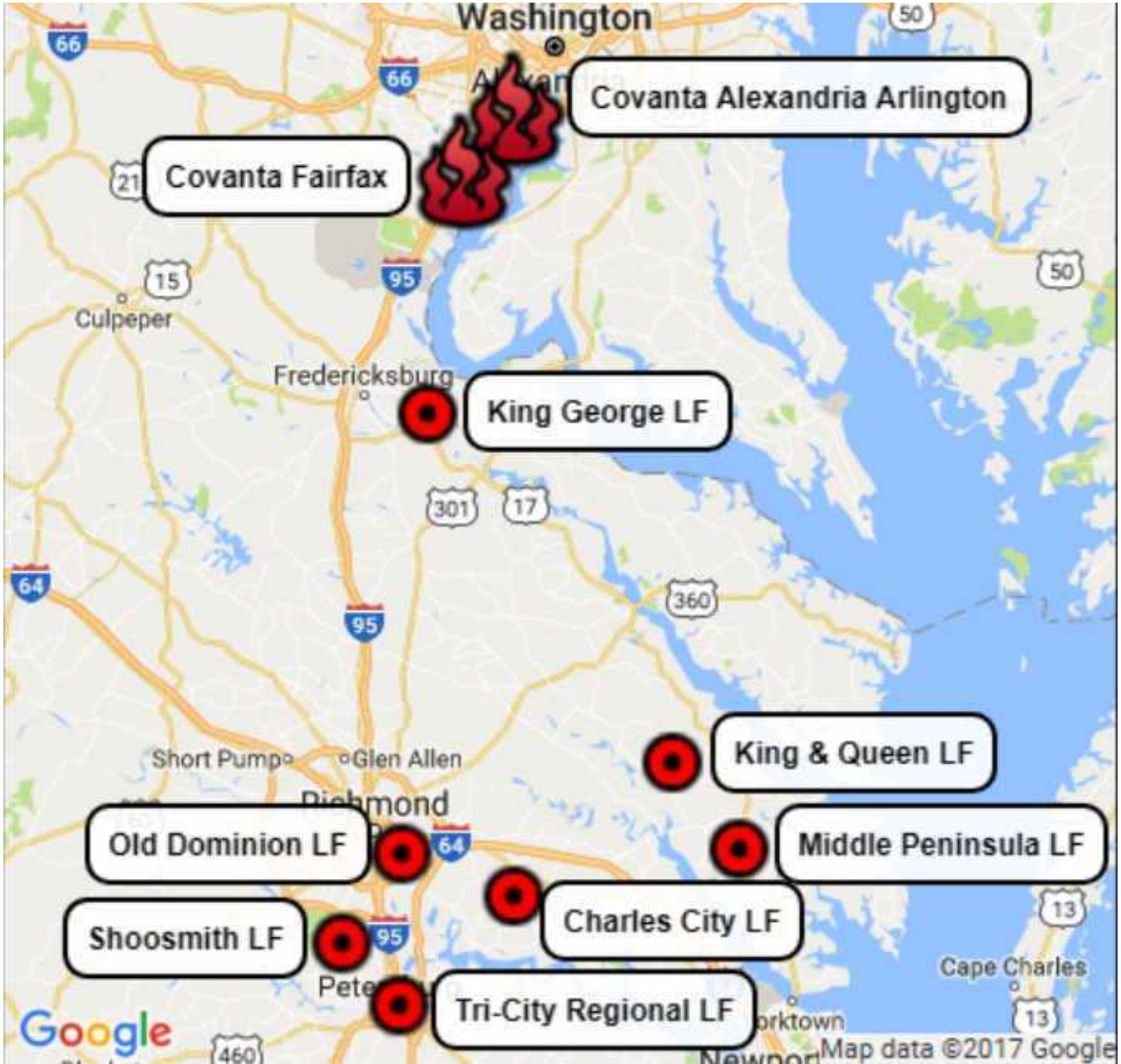
Data Sources

- **U.S. EPA**
  - National Emissions Inventory
  - Emissions & Generation Resource Integrated Database (eGRID)
  - FLIGHT (Greenhouse gas inventory)
  - Landfill Methane Outreach Program database
- **U.S. Energy Information Administration**
  - Form 860 database (Annual Electric Generator data)
  - Form 923 database (Annual Electric Utility Data)
- **Virginia Department of Environmental Quality**
- **DC Department of Public Works**
- **Energy Recovery Council**
- **Sound Resource Management Group**

Where DC's waste went (to VA) in 2016:

Covanta Fairfax	222,937	27%
Shoosmith Sanitary Landfill	221,415	27%
Middle Peninsula Landfill and Recycling Facility	190,323	23%
BFI Old Dominion Landfill	118,785	14%
Tri City Regional Disposal and Recycling Services	36,898	4%
King George Landfill & Recycling Center	20,002	2%
Covanta Alexandria Arlington	16,690	2%
King and Queen Sanitary Landfill	267	0%
Charles City County Landfill	18	0%
Total:	827,335	

Where DC's waste went (to VA) in 2016:



Facilities in Focus for 2017 & This Presentation

Facility Name	Type	Average Distance from DC Transfer Stations (mi)	Annual Precipitation (inches)	Years of Life Remaining
Covanta Fairfax	Incinerator	26		13 (if it lives to 40)
King George	Landfill	68	42.8	11
King & Queen	Landfill	122	45.4	26
Middle Peninsula	Landfill	130	45.4	73
Charles City	Landfill	130	46.3	74

[“Other 3 Landfills” in future slides refers to the last three above, which are all about the same distance from DC.]

Covanta Fairfax Reported Emissions (2014)

Global Warming Pollutants	**Pounds released (2014)**
Carbon Dioxide (CO2)	2,169,540,876
Methane (CH4)	762,927
Nitrous Oxide (N2O)	100,130
Health Damaging Pollutants	**Pounds released (2014)**
Carbon Monoxide	11,319
Hydrochloric Acid	57,408
Hydrofluoric Acid	1,385
Lead	68
Nitrogen Oxides (NOx)	3,398,301
Particulate Matter (PM10)	14,709
Fine Particulate Matter (PM2.5)	8,862
Sulfur Dioxide	257,899
Volatile Organic Compounds	11,813

Covanta Fairfax Emissions

Within 20 miles of DC's borders, Covanta Fairfax is…

- **#1 in Nitrogen Oxides**
  - So high that Covanta's home state of New Jersey singled out this incinerator as ineligible to sell renewable energy credits to NJ
  - #2 in the entire industry, worse than the Detroit incinerator (which has no NOx controls)
- **#1 in Carbon Dioxide**
- **#1 in Hydrochloric Acid**
- **#1 in Hydrofluoric Acid (was worst in their industry in 2008)**
- **#1 in Mercury**
- **#4 in Sulfur Dioxide**
- **Top 10 in Lead**
- **#3 in overall air pollution (after Dulles and DCA Airports)**

Life Cycle Analysis on DC Waste Options

- All comparison data includes pollution from trucking.
  - Note the tiny difference that doubling hauling distance makes.
- A 75% landfill gas capture rate is assumed, based on what was reported to us in calls to the four landfills. All three we reached independently reported the same percentage.
- For the landfills, the best data available for DC waste composition is used. Where categories were vague, we filled in the proportions with more detailed data from Montgomery County's waste characterization study. Actual emissions data for Covanta Fairfax is used, as reported to EPA.
- We used local precipitation data from the areas where the landfills are located, which is wetter than average.
- "Other 3 Landfills" = King & Queen LF, Middle Peninsula LF, and Charles City LF

Conservative Assumptions on Global Warming

- This study looks at the 20-year impact (most relevant for methane's impacts on global warming) as well as the 100-year impact. The 20-year impact, based on methane being worse in the short-term, makes landfills out to be worse than they are when evaluated over 100 years.

- This study uses the latest science for methane's global warming potential (86 times worse than CO2 over 20 years based on the latest International Panel on Climate Change report).

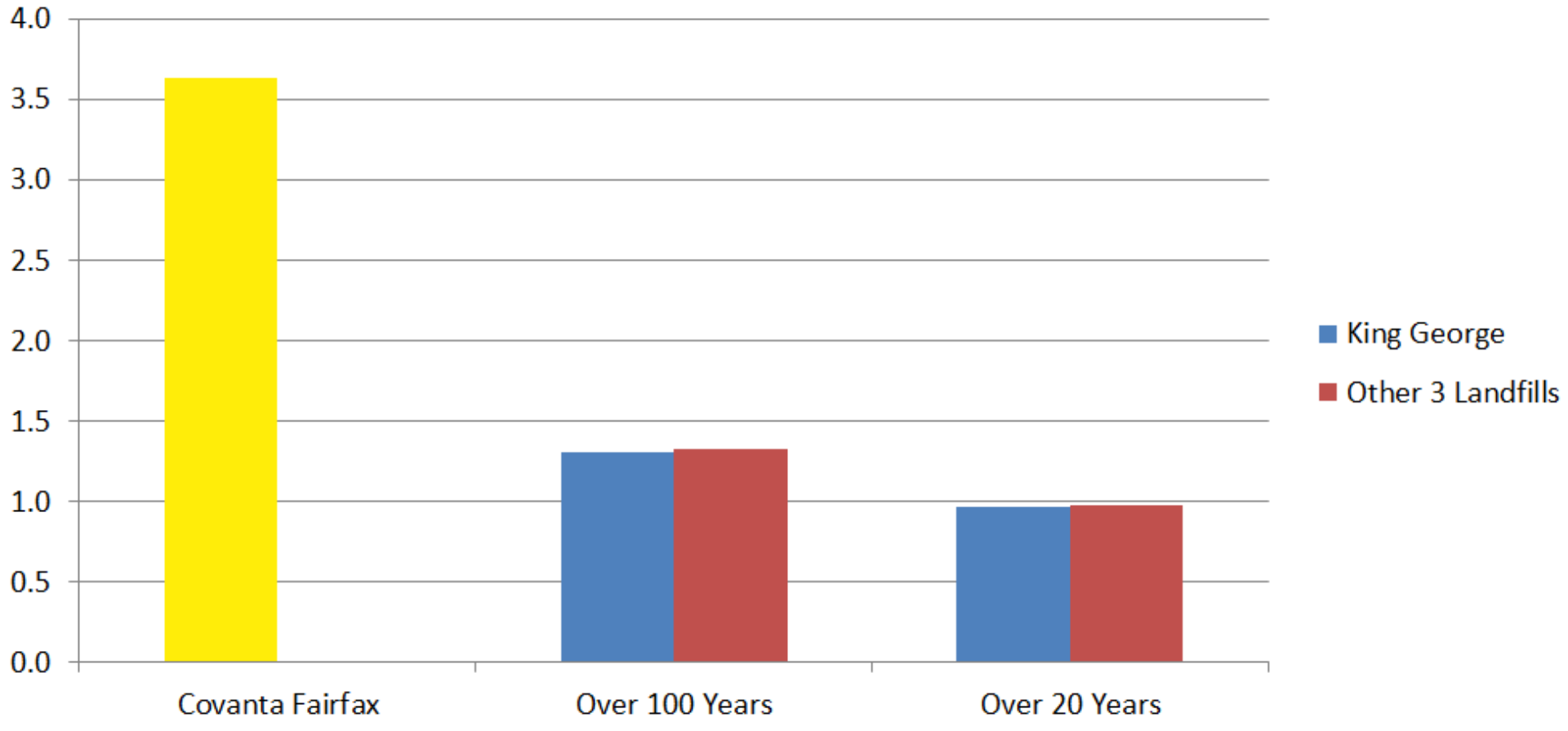
See www.energyjustice.net/naturalgas/#GWP for a link to the various data sources in the evolving science on global warming potentials.

Conservative Assumptions on Toxicity

- This study did not factor in two main things that would also trend toward incinerators being worse than landfills:
  - It did not include data on leaching of toxic chemicals from incinerator ash, but DID include leaching from trash. In fact, leaching of toxic chemicals from incinerator ash is expected to be worse, especially where the ash is used as landfill cover or is mixed with municipal solid waste, as it is in Old Dominion Landfill.
  - Dioxin/furan emissions were not included. This was due to a lack of good data on dioxin emissions from landfills. Dioxins and furans are the most toxic man-made chemicals known to science, and are largely associated with incineration sources, so ignoring them biases the study in a conservative way, making incinerators out to be less toxic than they truly are.

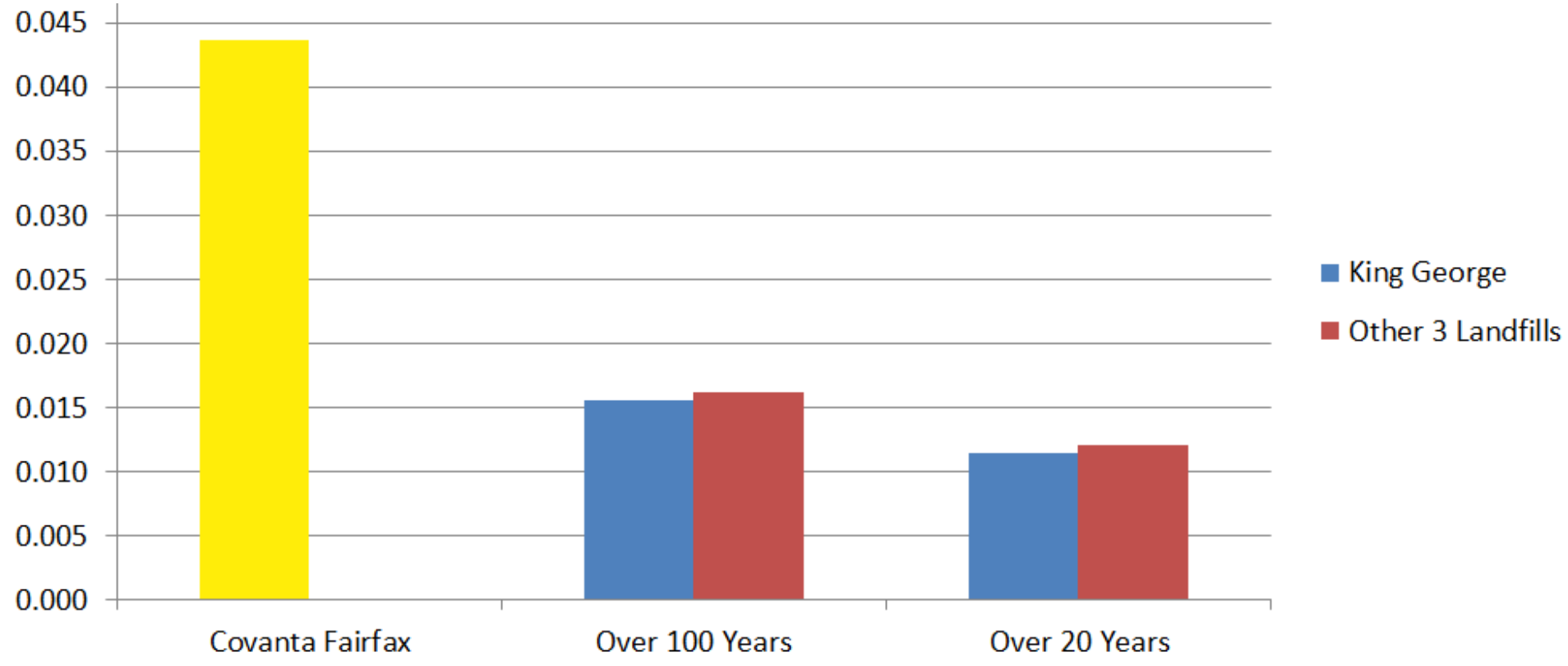
Nitrogen Oxide (NOx) Pollution

[Pounds of NOx per ton of waste disposed.]



Particulate Matter Pollution

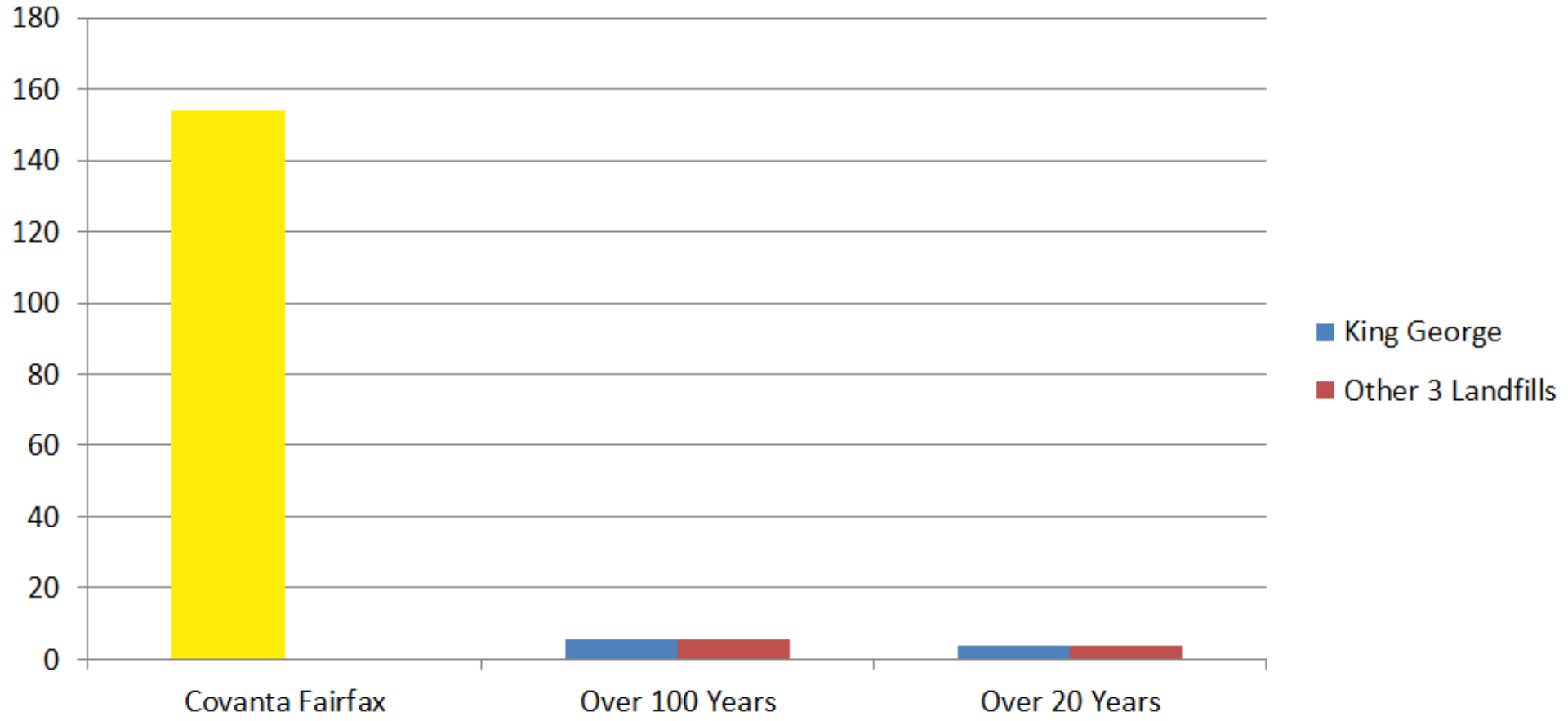
[Pounds of PM2.5 equivalent per ton of waste disposed.]



Toxic Pollution

[Pounds of toluene equivalent per ton of waste disposed.]

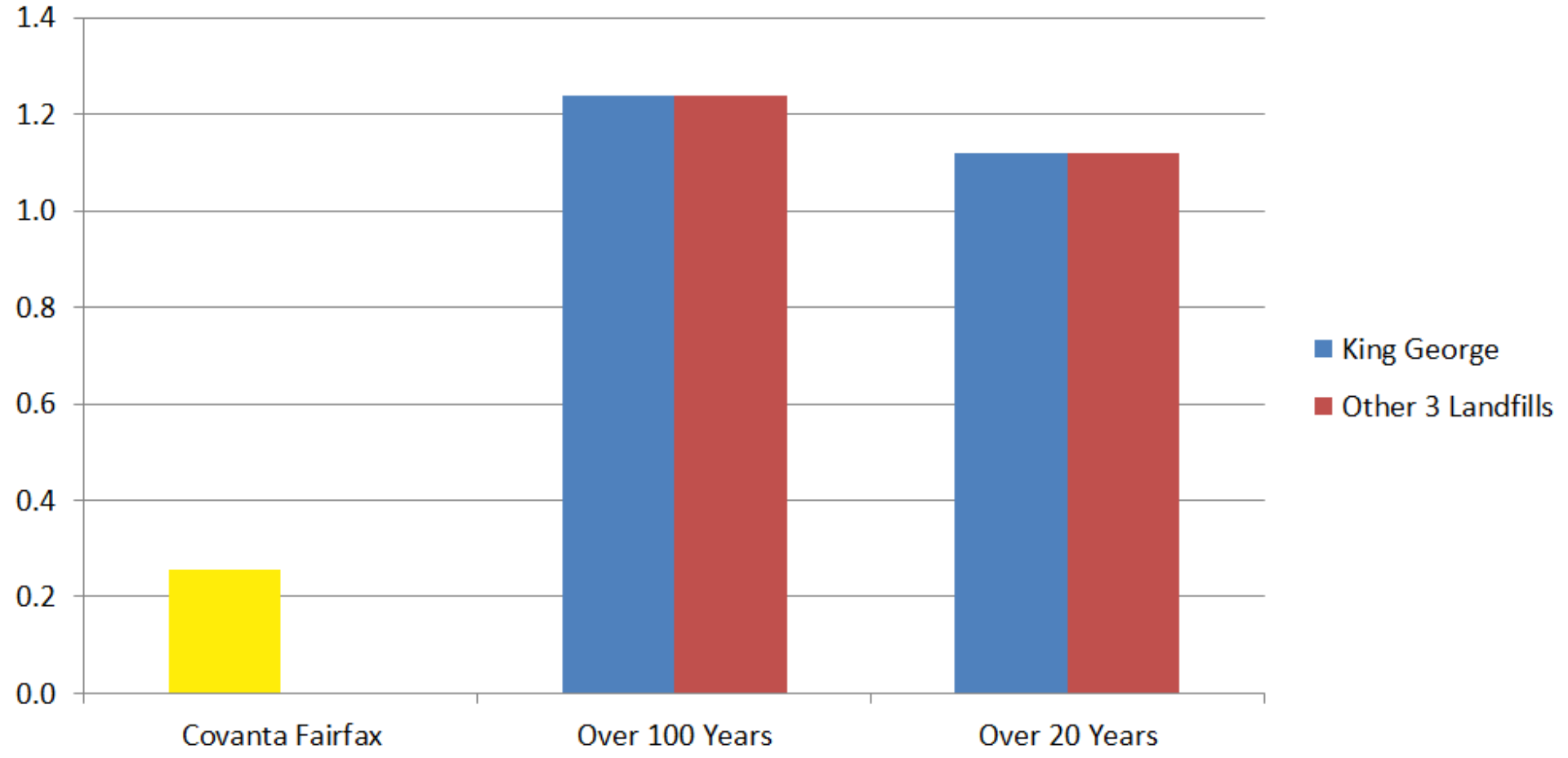
Does not include dioxin/furan emissions or ash leaching.



Carcinogenic Pollution

[Pounds of benzene equivalent per ton of waste disposed.]

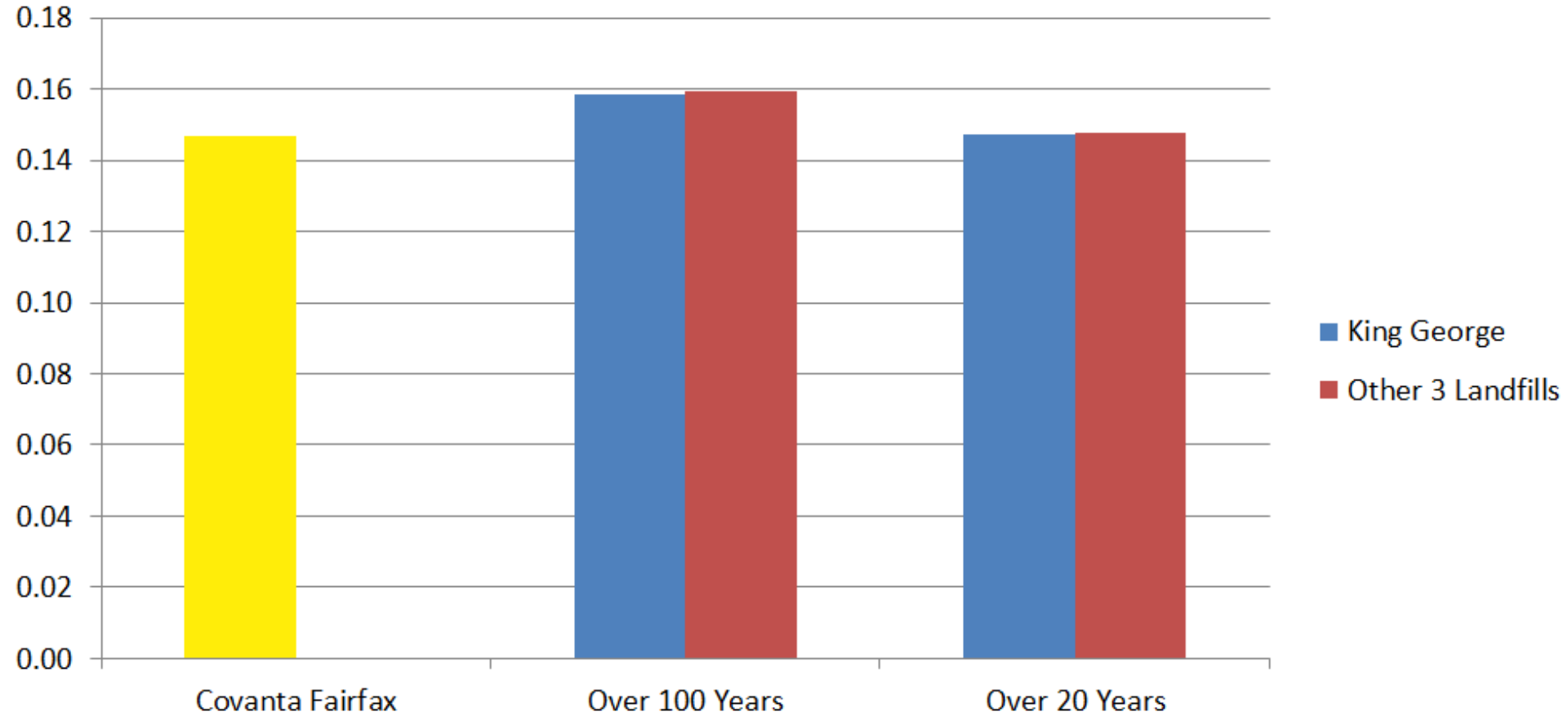
Does not include dioxin/furan emissions or ash leaching.



Eutrophication

[Pounds of nitrogen equivalent per ton of waste disposed.]

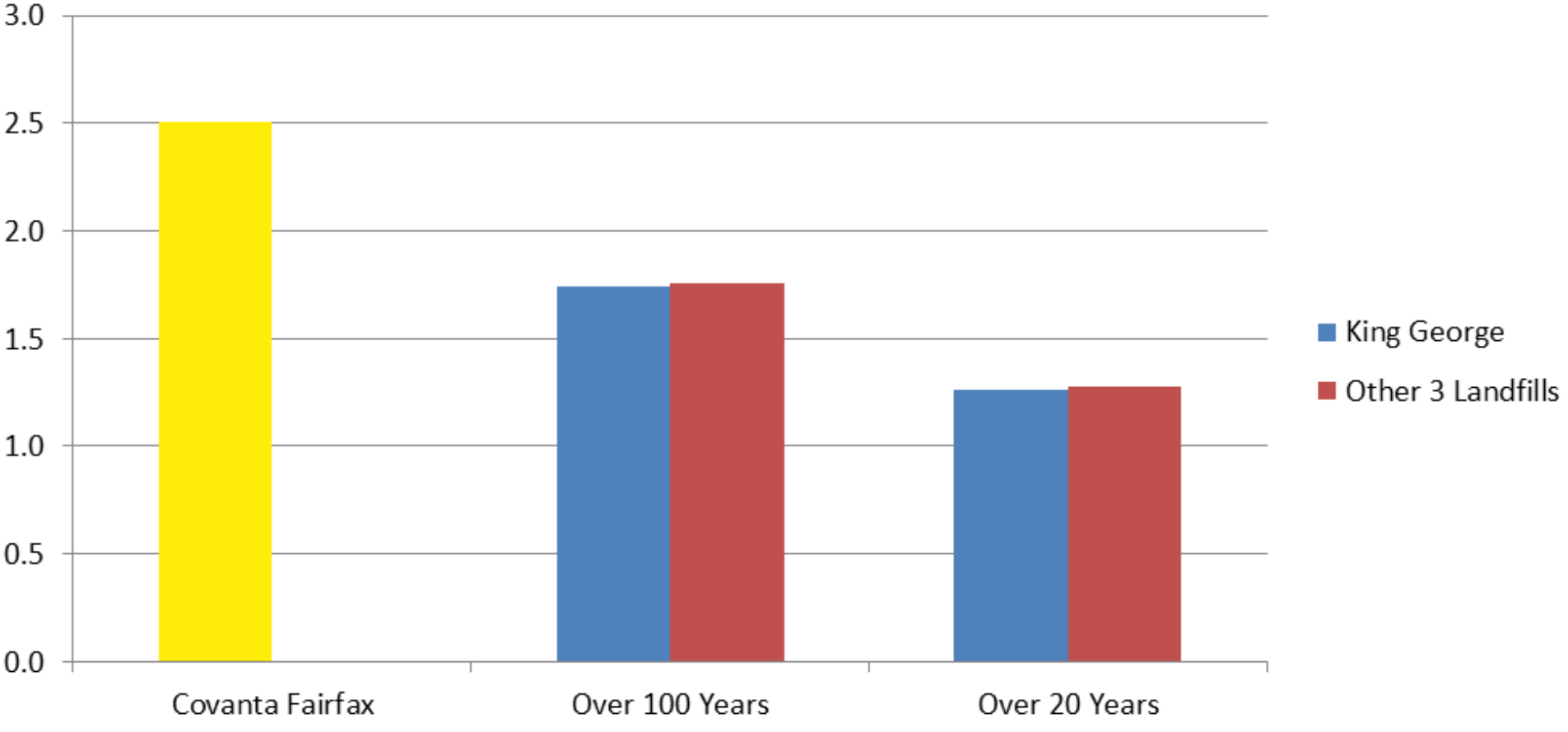
NOx and ammonia air emissions plus BOD, COD, phosphate, and ammonia water releases from landfills.



Acidification

[Pounds of SO_2 equivalent per ton of waste disposed.]

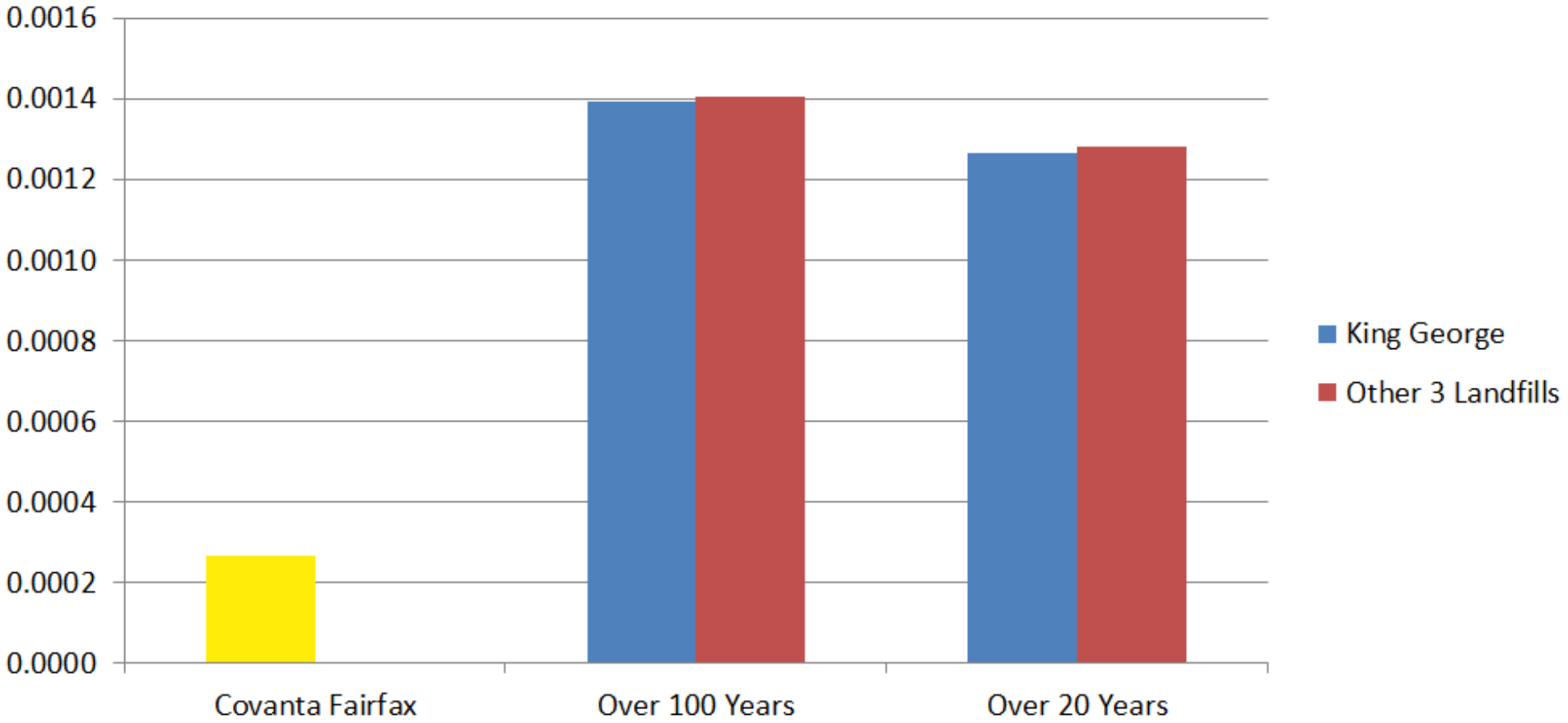
Incinerator emissions are largely from nitrogen oxides, but also include other acid gases (SO_2, HCl, HF). For the landfills, it's hydrogen sulfide (H_2S) from the landfill, plus ammonia, NOx and SOx from the landfill gas burners.



Ecosystems Toxicity

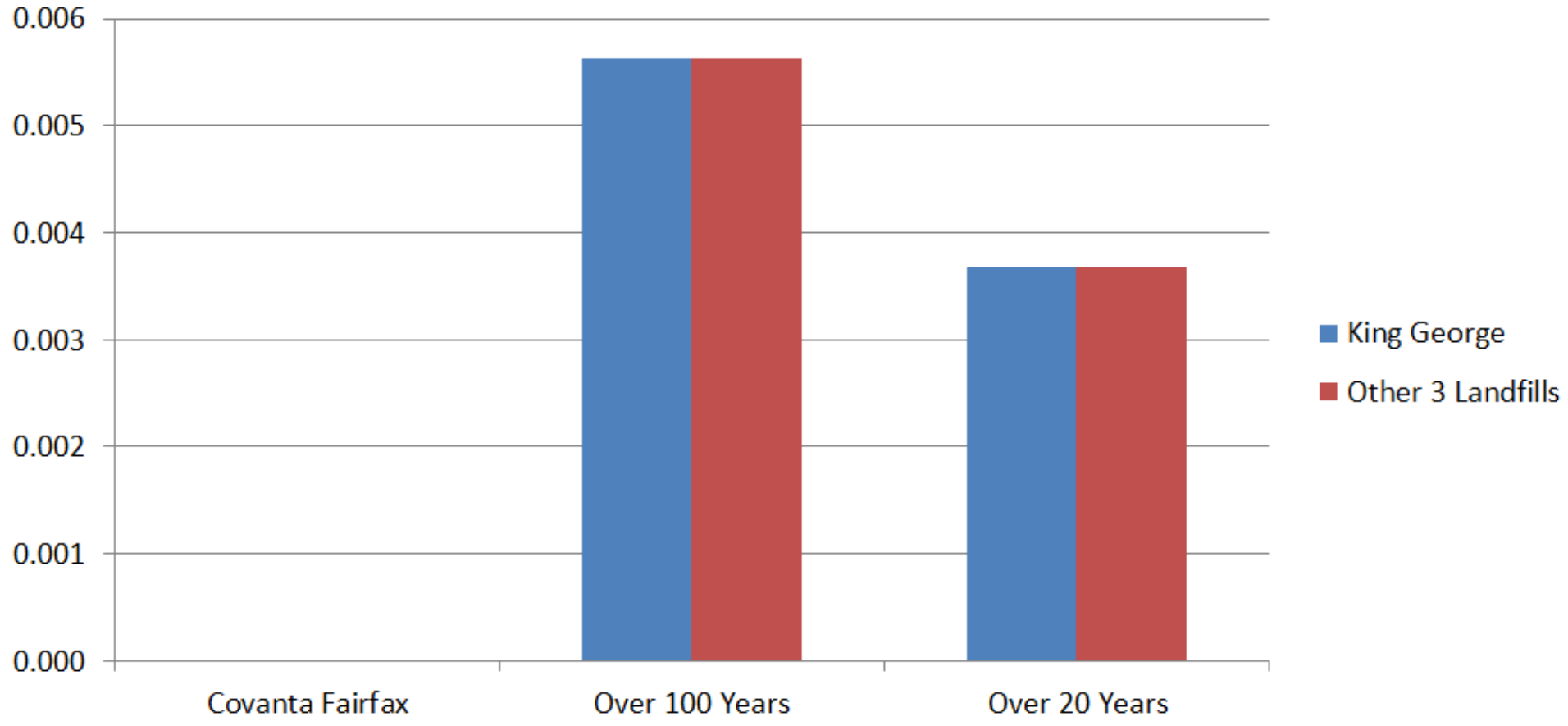
[Pounds of 2,4-D herbicide equivalent per ton of waste disposed.]

For the incinerator, this is mainly based on mercury emissions. For the landfill, mainly formaldehyde.



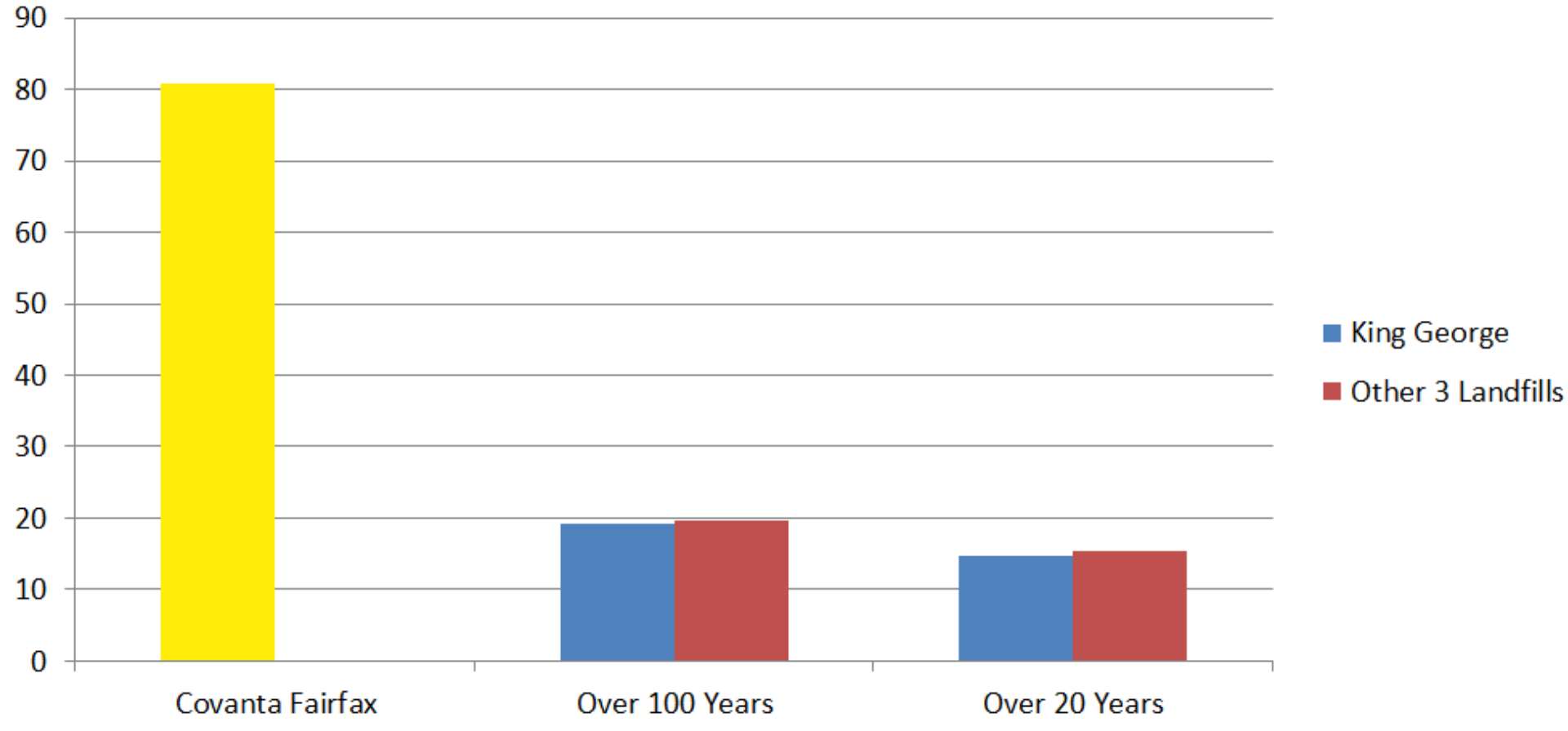
Ozone Depletion

[Pounds of CFC-11 equivalent per ton of waste disposed.]



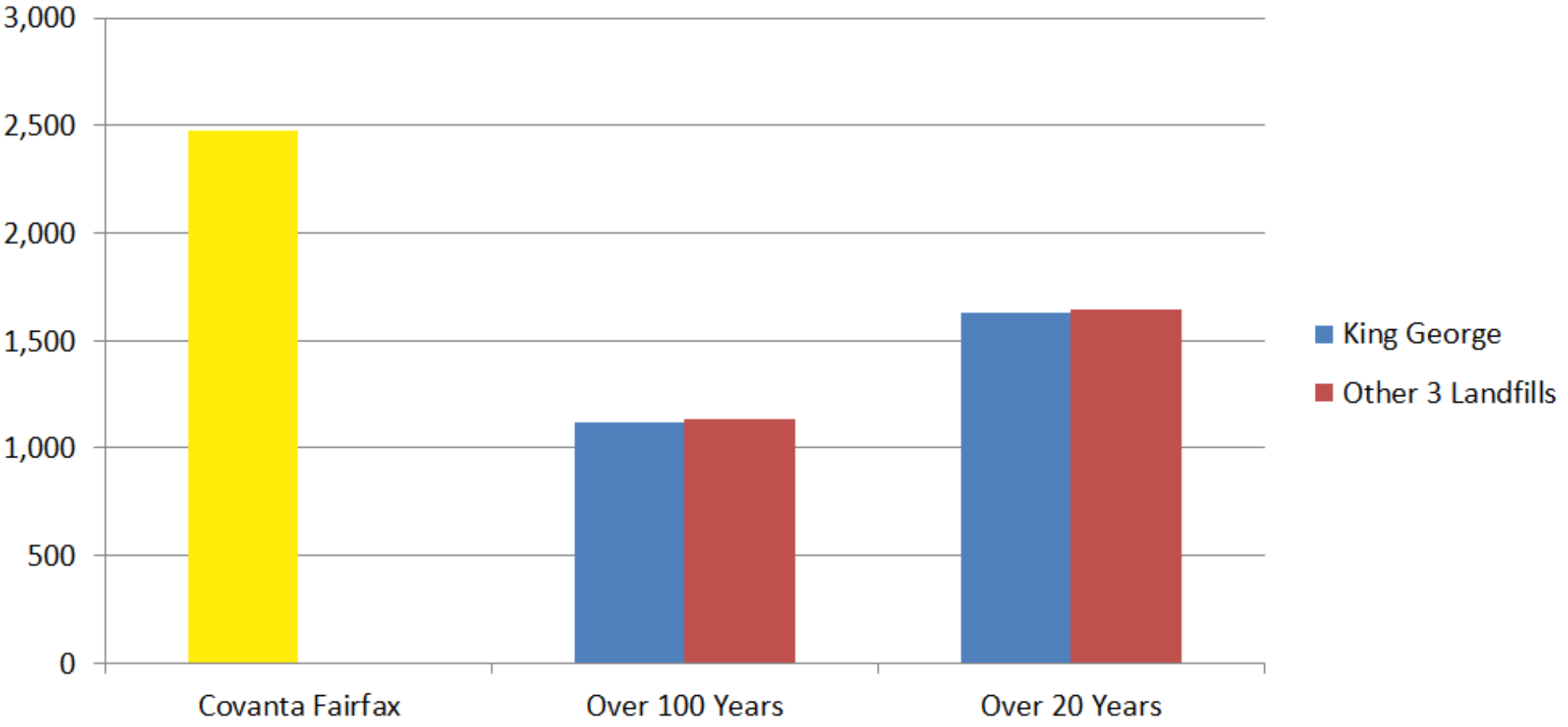
Smog Formation

[Pounds of ozone (O_3) equivalent per ton of waste disposed.]

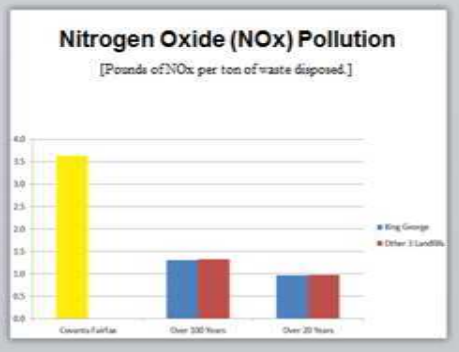


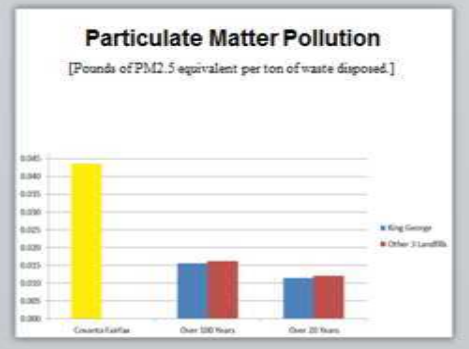
Global Warming Pollution

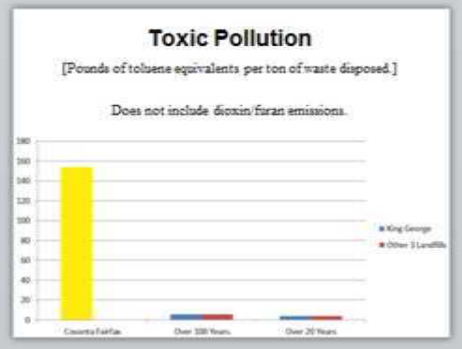
[Pounds of CO_2 equivalent per ton of waste disposed.]

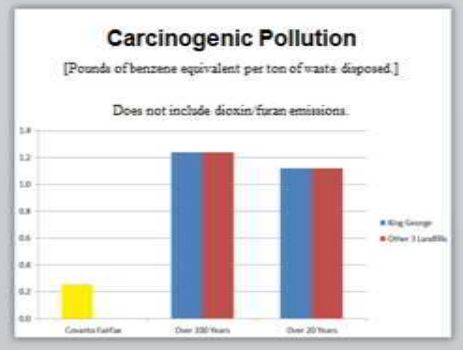


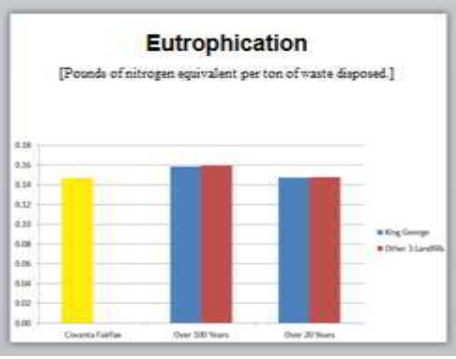
Incineration worse than Landfills

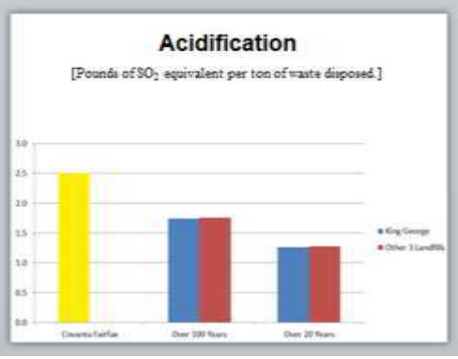


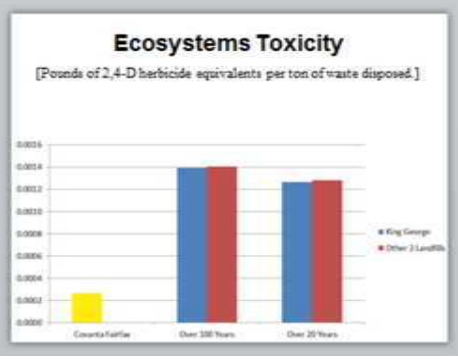


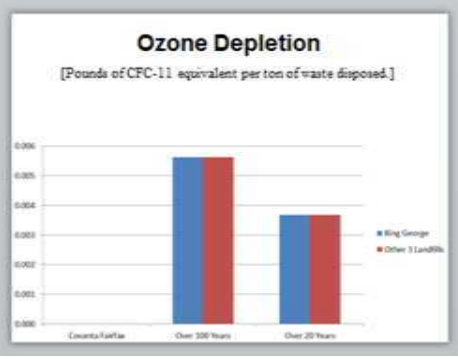


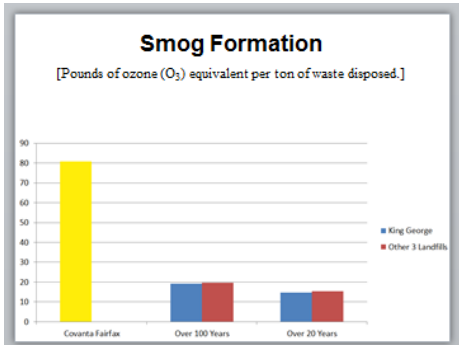


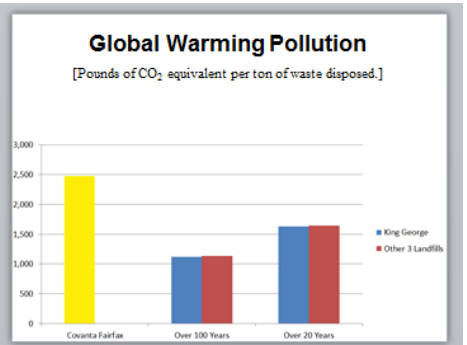












Trash Incineration (with ash landfilling) is Worse than Landfills

Incineration is worse for:

- Global warming
- Toxic emissions
- Nitrogen Oxide emissions (asthma)
- Particulate Matter emissions
- Acid rain
- Smog
- Cost
- Number of people impacted
- Environmental racism
- Jobs

Landfills are worse for:

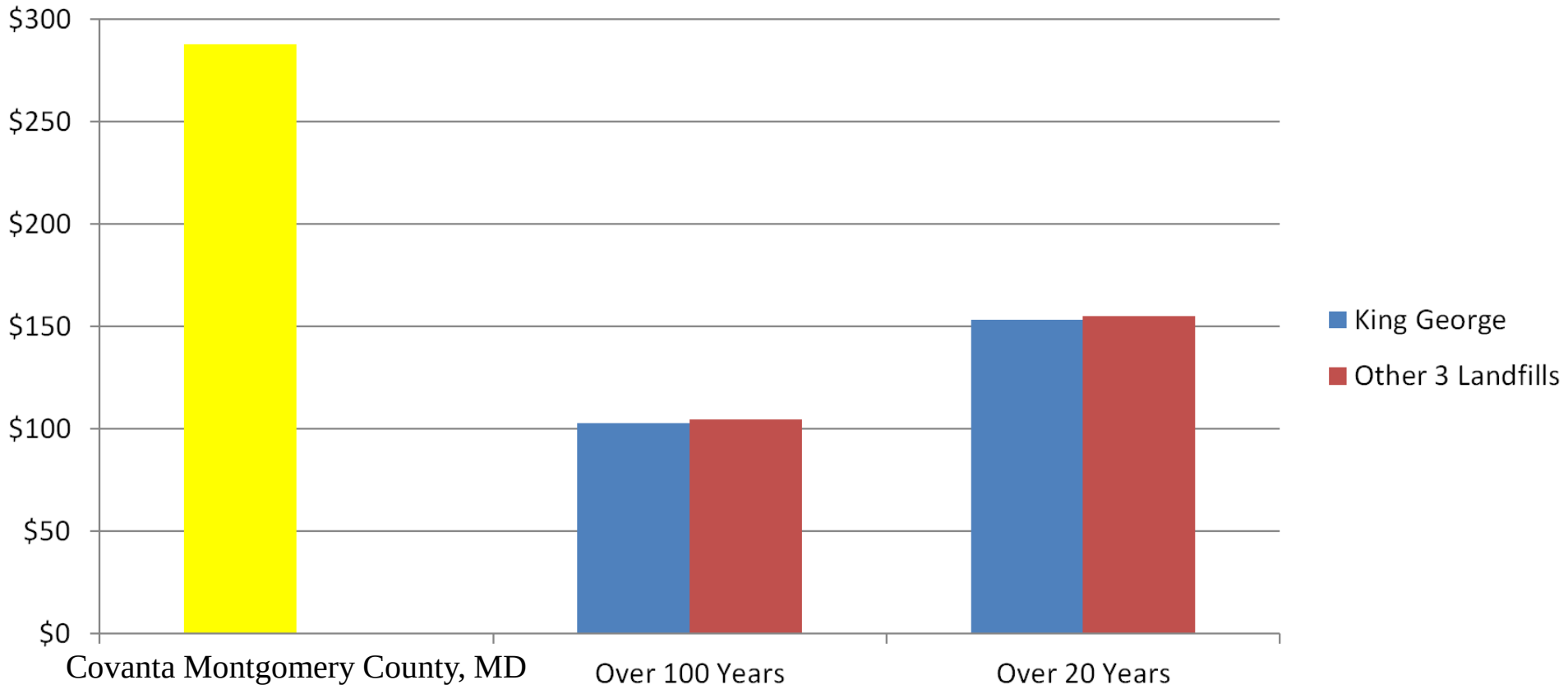
- Ozone depletion
- Carcinogenic emissions
- Pesticide-like chemicals

All together now…

Monetized Health & Environmental Cost

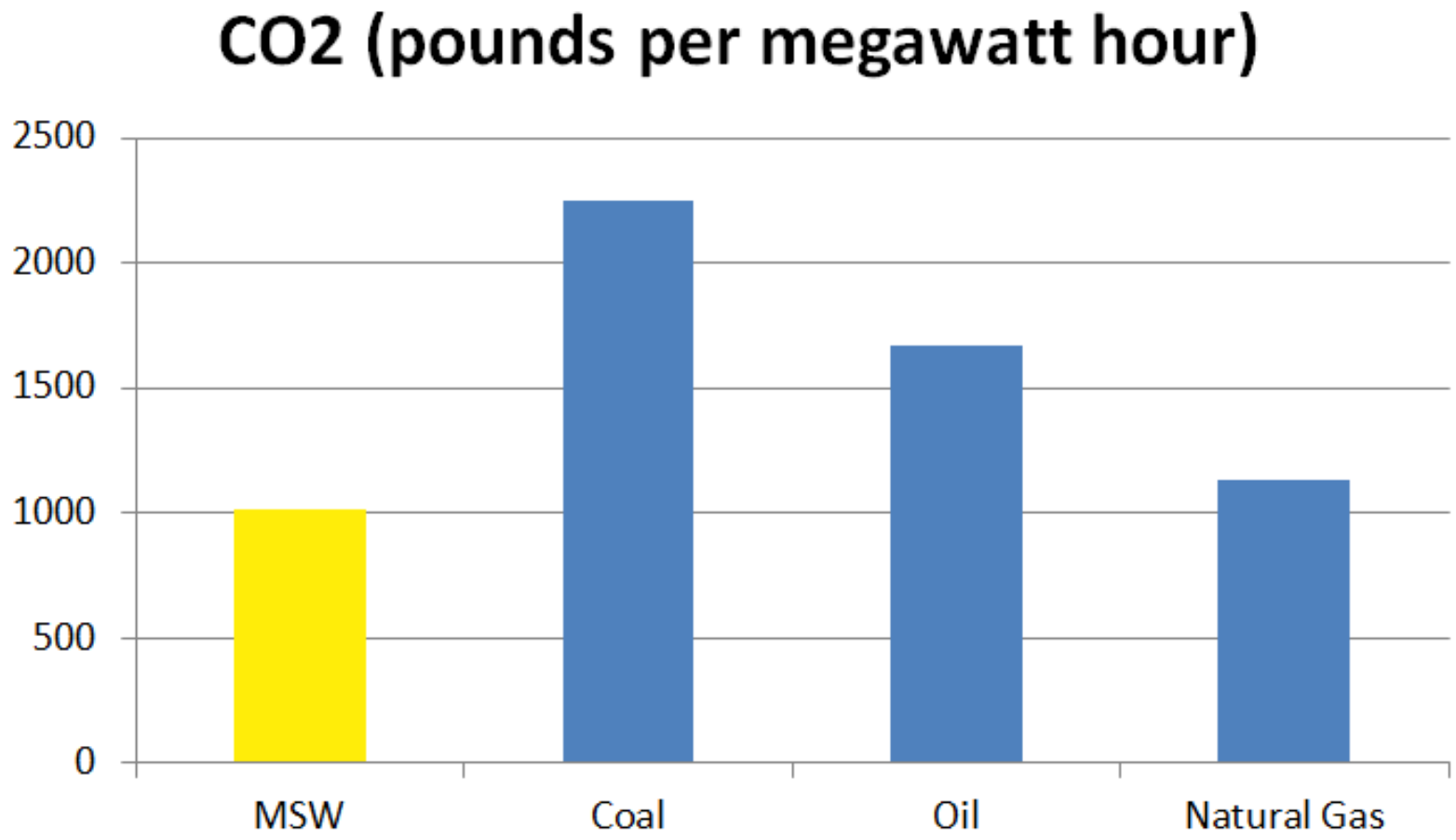
[All impacts combined and monetized.]

$288/ton for incineration vs. $103-155/ton for landfilling.



Global Warming Pollution

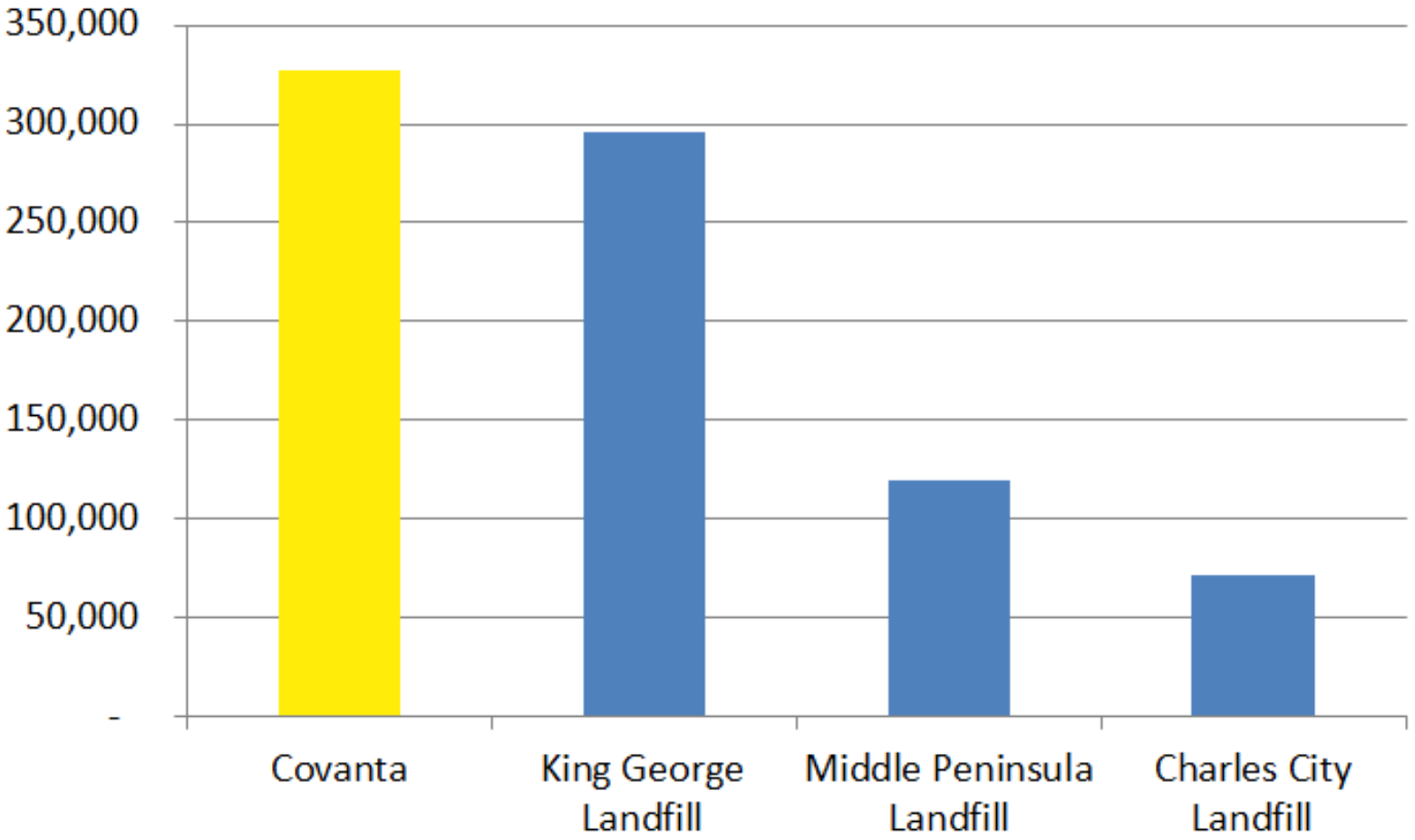
[EPA Public Relations on MSW Incineration]



Global Warming Pollution

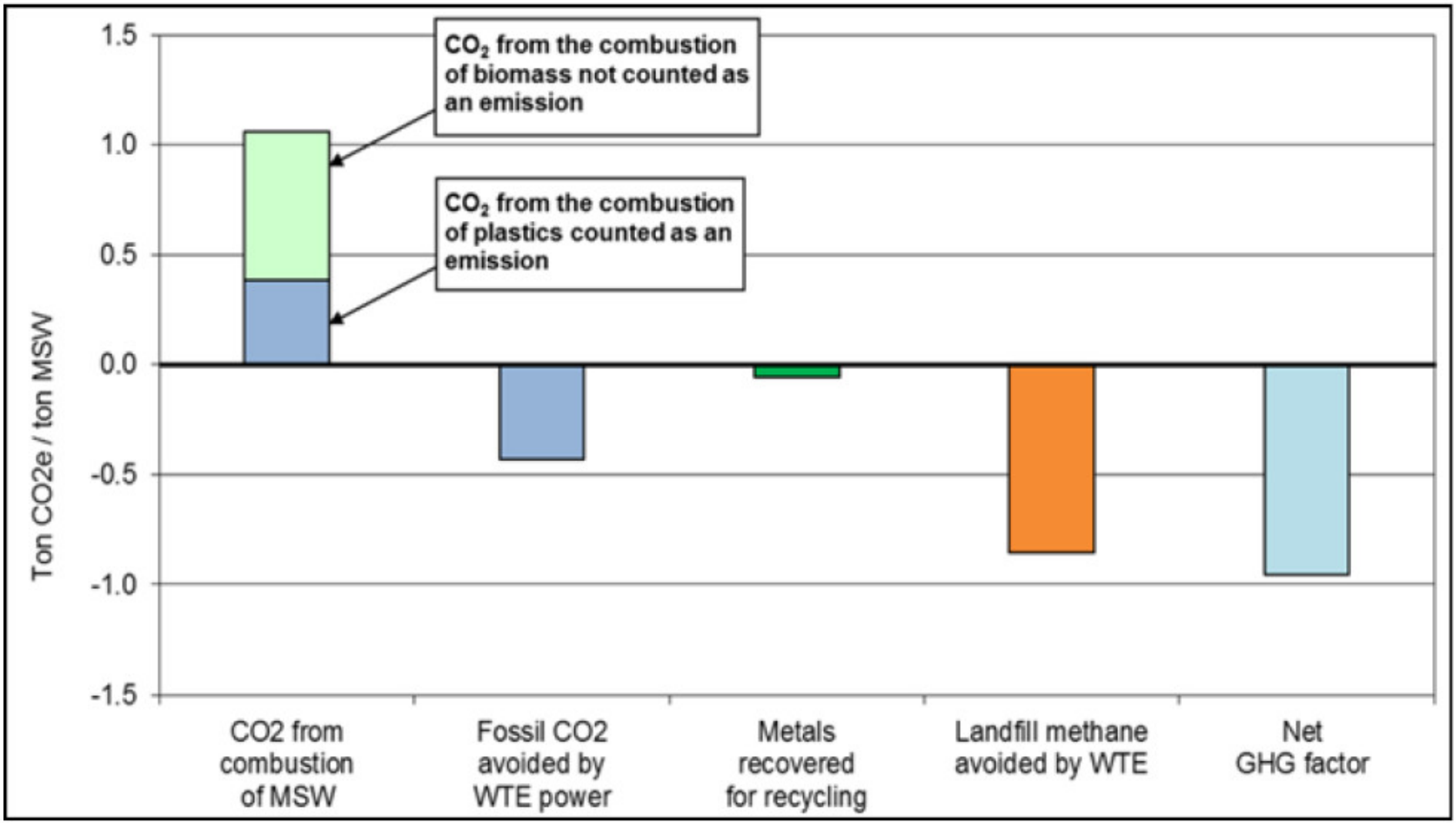
[EPA FLIGHT Data in 2015 metric tons CO2 equivalent.]

NOTE: This ignores biogenic emissions from incineration, but not from landfills, making Covanta seem half as bad as they are.



Global Warming Pollution

[Energy Recovery Council Public Relations on MSW Incineration]



Center for American Progress

Energy from Waste Can Help Curb Greenhouse Gas Emissions

Matt Kasper April 17, 2013

Sponsored by the incinerator industry, with $50-100K/year from…

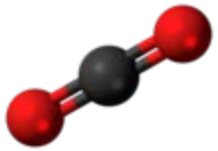
COVANTA®

Powering Today. Protecting Tomorrow.

Ray of sunshine encounters a CO_2 molecule in the atmosphere...

Ray of sunshine: Did you come from a tree?

CO_2 molecule: Why yes, I did!



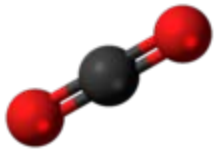
Ray of sunshine: Ok, I won't heat you up, then. Have a nice day!

(This is NOT how it works. There is no "magic tree carbon.")

Ray of sunshine encounters a CO_2 molecule in the atmosphere...

Ray of sunshine: Did you come from a tree?

CO_2 molecule: Why yes, I did!



Ray of sunshine: Ok, I won't heat you up, then. Have a nice day!

(This is NOT how it works. There is no "magic tree carbon.")

WHY? 1) Double Counting
2) Carbon in trees/plants/soils isn't same as in air
3) Don't have time

Congress Says Biomass Is Carbon-Neutral, but Scientists Disagree

Using wood as fuel source could actually increase CO_2 emissions

By Chelsea Harvey, Niina Heikkinen, E&E News on March 23, 2018

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0 minute ago — Heidi Ledford and Nature magazine

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Spread of Deadly Mosquito-borne Disease May Be Linked to Climate Change

2 hours ago — Maya Earls and E&E News

PUBLIC HEALTH

Five Interventions for Treating Multidrug-Resistant TB

3 hours ago — Ifeanyi Nsofor

How incineration GHGs downplayed

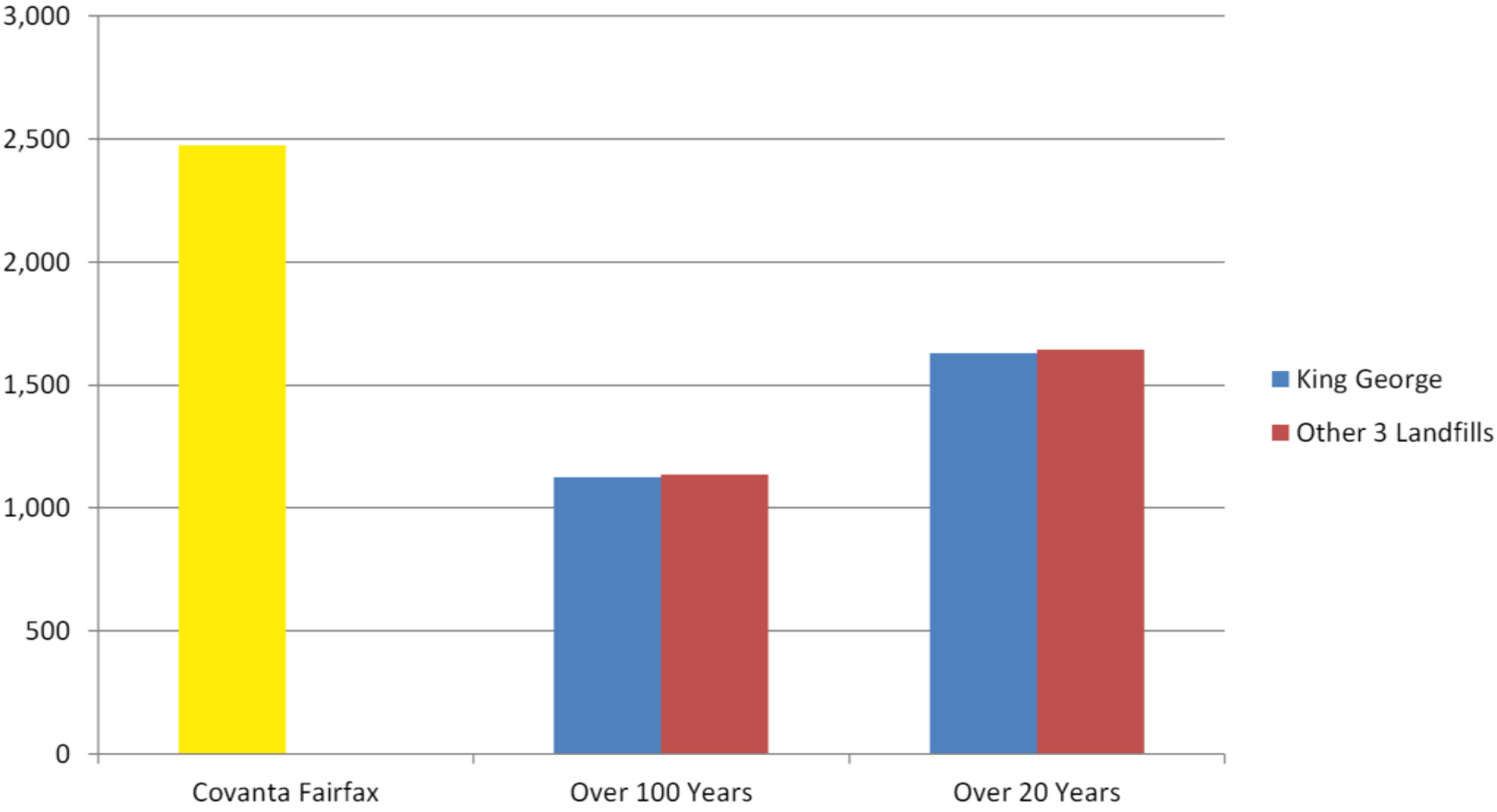
- Ignoring the "biogenic" half of carbon emissions from incinerators while counting all of the GHGs (all "biogenic") from landfills.
  - Biomass carbon neutrality has been scientifically debunked. See a compilation of the science here: www.energyjustice.net/biomass/carbon
- Pretending "biogenic" carbon's share in MSW is larger than the 52.7% that EPA factors into their eGRID data.
  - The trend should be the opposite, with newspapers disappearing and plastic packaging replacing glass.
- Subtracting avoided methane emissions from landfills, as if conventional landfills are the only alternative.
  - Invalid when comparing incinerators to landfills, as the same assumption could be made for landfills, letting them subtract incinerator emissions.
- Subtracting emissions from offsetting fossil fuel electricity
  - …as if they're not actually competing with wind power within the state's Renewable Portfolio Standard law.

Details at: www.energyjustice.net/incineration/climate

Global Warming Pollution

[Pounds of CO_2 equivalent per ton of waste disposed.]

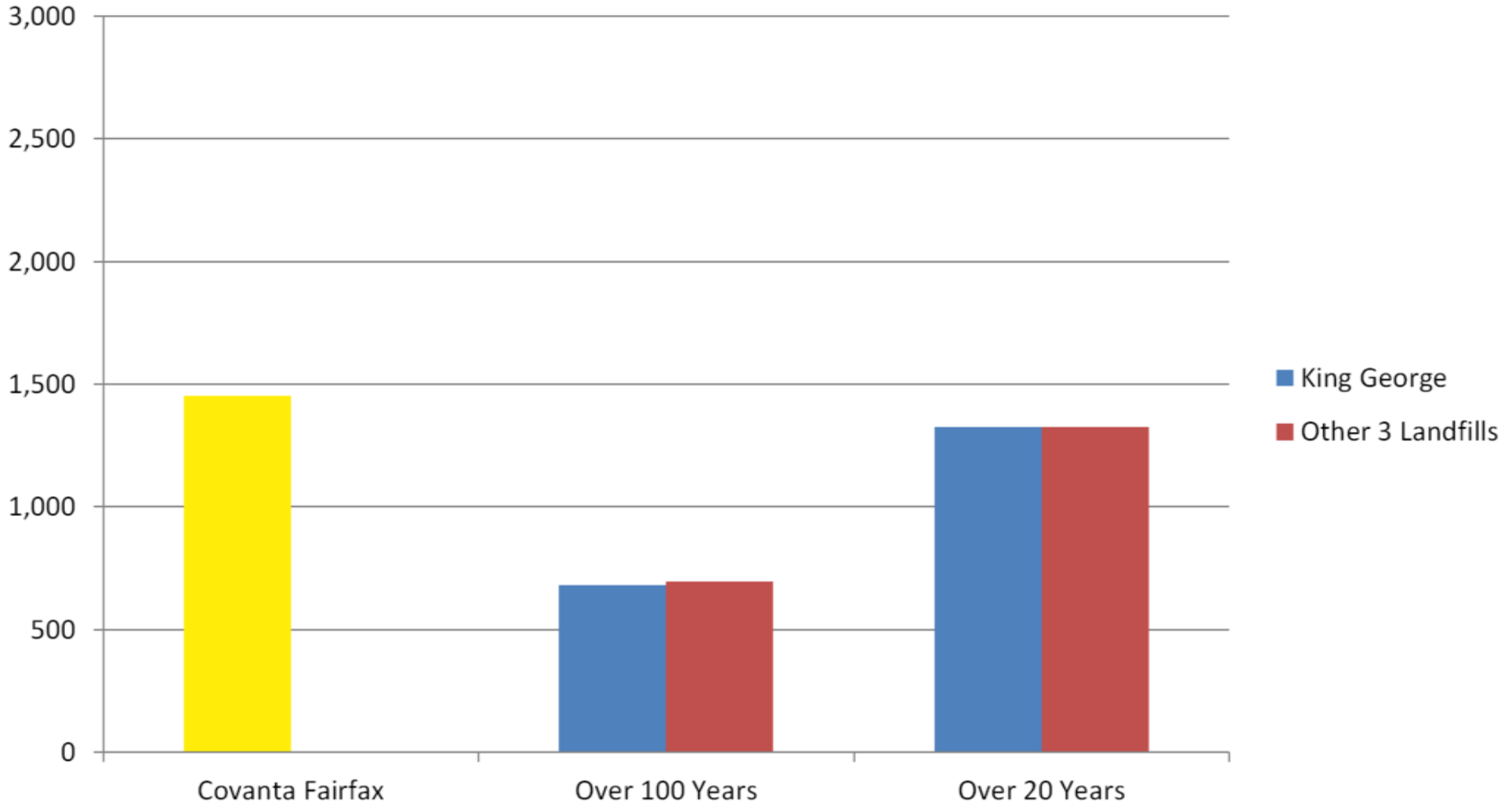
(Displacing wind / no energy displacement factored in)



Global Warming Pollution

[Pounds of CO_2 equivalent per ton of waste disposed.]

(Displacing Coal)



Evaluating Energy Displacement

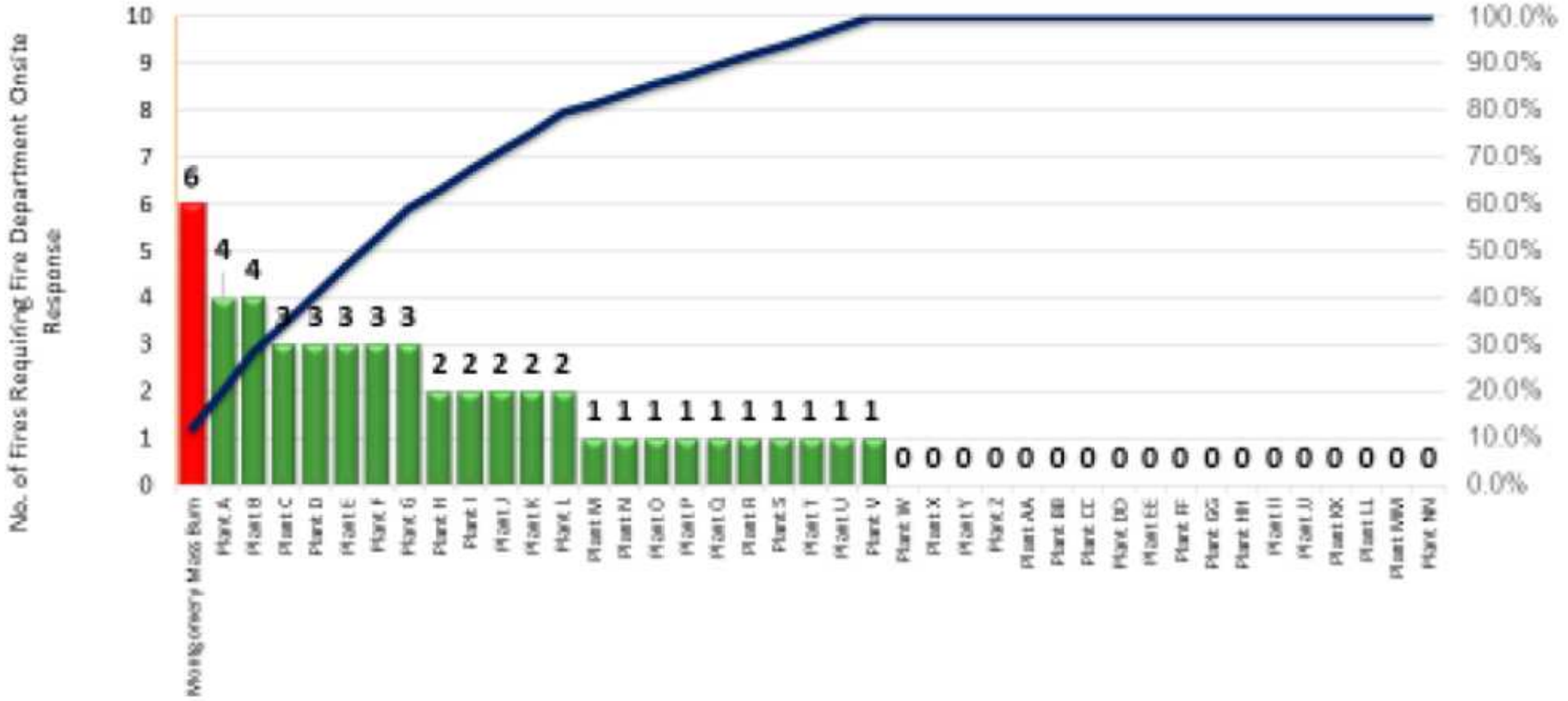
- Even if we assume that coal power is being displaced, incineration comes out 10% worse for the climate than coal in the short term (20-years), and 113% worse than (2.1 times as bad as) landfilling in the long-term (100 years).
- Coal displacement is an extreme assumption, and completely unlikely:
  - No one is building new coal power plants anymore.
  - Coal assets are being retired rapidly across the country. Coal mining companies are going bankrupt.
  - U.S. coal production has peaked in 2002 in terms of energy value extracted, leaving the more expensive and harder to reach coal deposits, most of which will never be extracted because gas, and increasingly wind and solar, are undercutting and replacing coal.

“In our industry, and in the waste industry as a whole, fires are becoming more prevalent.”

-Mark Harlacker – Covanta’s Commercial Business Director for Mid-Atlantic Region, 4/26/2017 testimony before DC City Council

Covanta Mass Burn 5 Year Fire History

No. of Fires Requiring Fire Department Onsite Response



COVANTA
Powering Today. Protecting Tomorrow.

Trash Incinerator Health Impacts

Health effects…

Air Pollutant	Health Effects
Nitrogen Oxides	triggers asthma attacks, increases lifetime risk of chronic respiratory disease and stroke
Sulfur Dioxide	triggers asthma attacks, increases lifetime risk of chronic respiratory and heart diseases and stroke
Hydrochloric Acid	irritates eyes, skin, and nose, damages lungs
Carbon Monoxide	causes headaches and dizziness; increases lifetime risk of heart disease
Particulate matter (soot)	heart attacks, stroke, irregular heartbeat, aggravated asthma, decreased lung function, difficulty breathing
Fine Particulate matter	same as above, but worse, as it can get deep into lungs and into blood stream
Volatile Organic Compounds	eye, nose and throat irritation, headaches, loss of coordination and nausea, liver, kidney and central nervous system damage, cancer
Formaldehyde	irritates eyes, skin, and nose, increases lifetime risk of cancer
Hydrogen Fluoride	lung, liver, and kidney damage, skeletal fluorosis (brittle bones)
Lead	causes damage to nervous system and kidneys, lowers IQ in children, increases likelihood of antisocial behavior
Mercury	causes damage to nervous, digestive, and immune systems, lowers IQ in children
Nickel	lung and nasal cancers
Chromium (VI)	lung cancer, shortness of breath, coughing, and wheezing

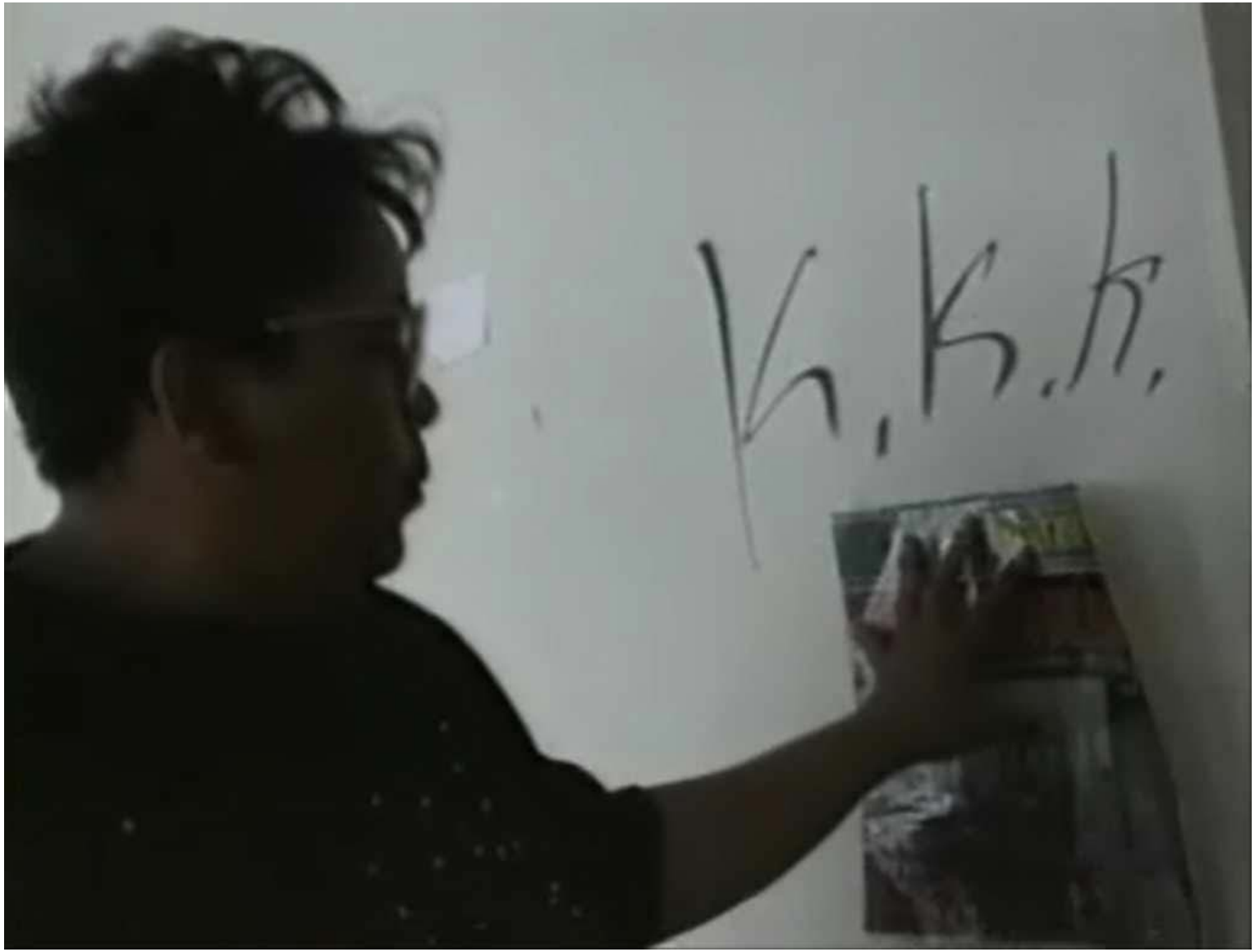
Health effects

People living near incinerators have an increased risk of…

- **All types of cancer, including:**
  - **Stomach**
  - **Colorectal**
  - **Liver**
  - **Renal**
  - **Lung & pleural**
  - **Gallbladder**
  - **Bladder**
  - **Non-Hodgkin lymphoma**
  - **Leukemia**
  - **Soft-tissue sarcoma**
- **Respiratory diseases & symptoms**
- **Cardiovascular diseases**
- **Urinary diseases**

Source: www.energyjustice.net/incineration/healthstudies.pdf

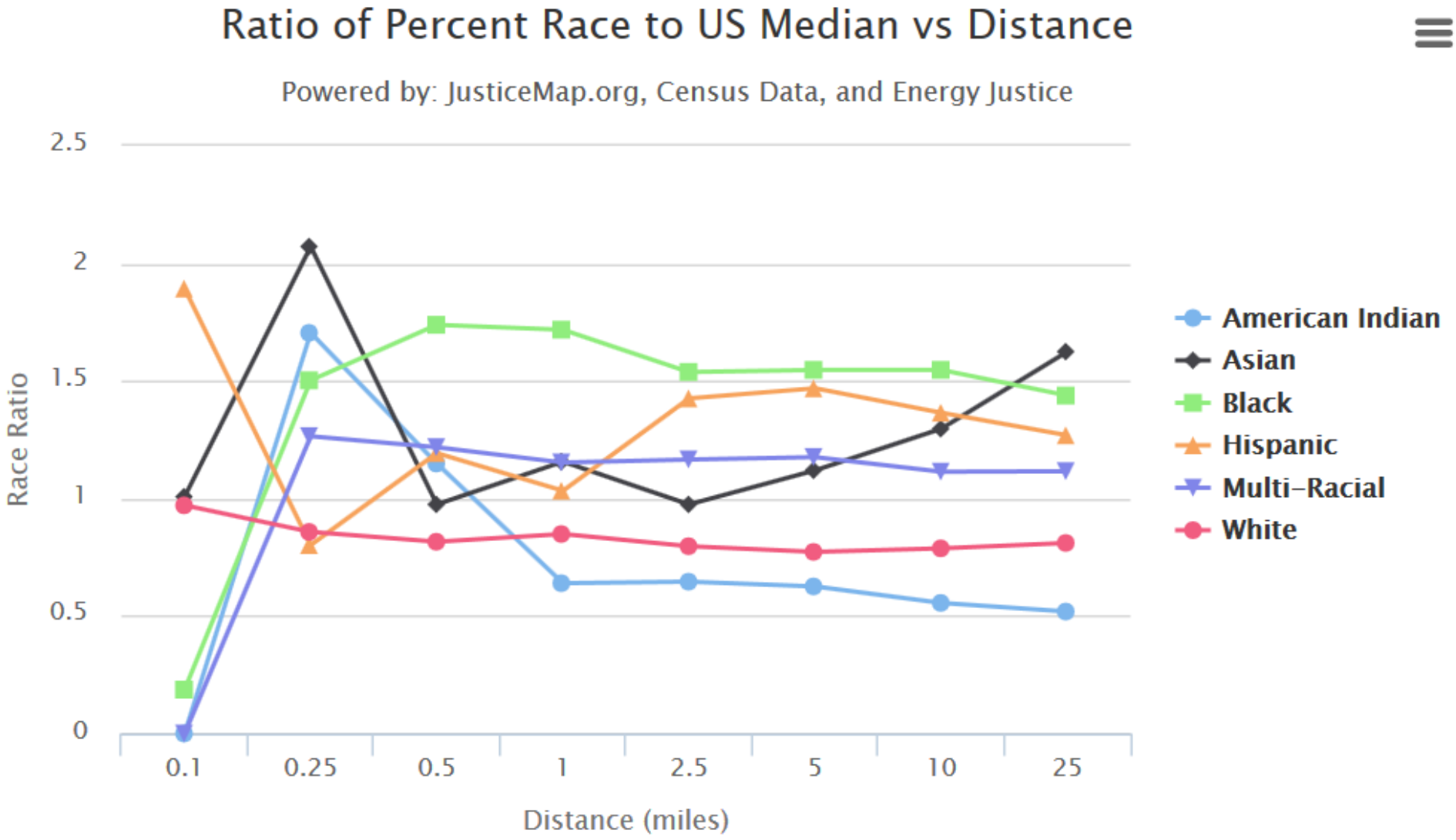
Racism isn’t usually this obvious…



Zulene Mayfield shows signs of vandalism at office of Chester Residents Concerned for Quality Living in Chester, PA in 1996 “Laid to Waste” documentary.

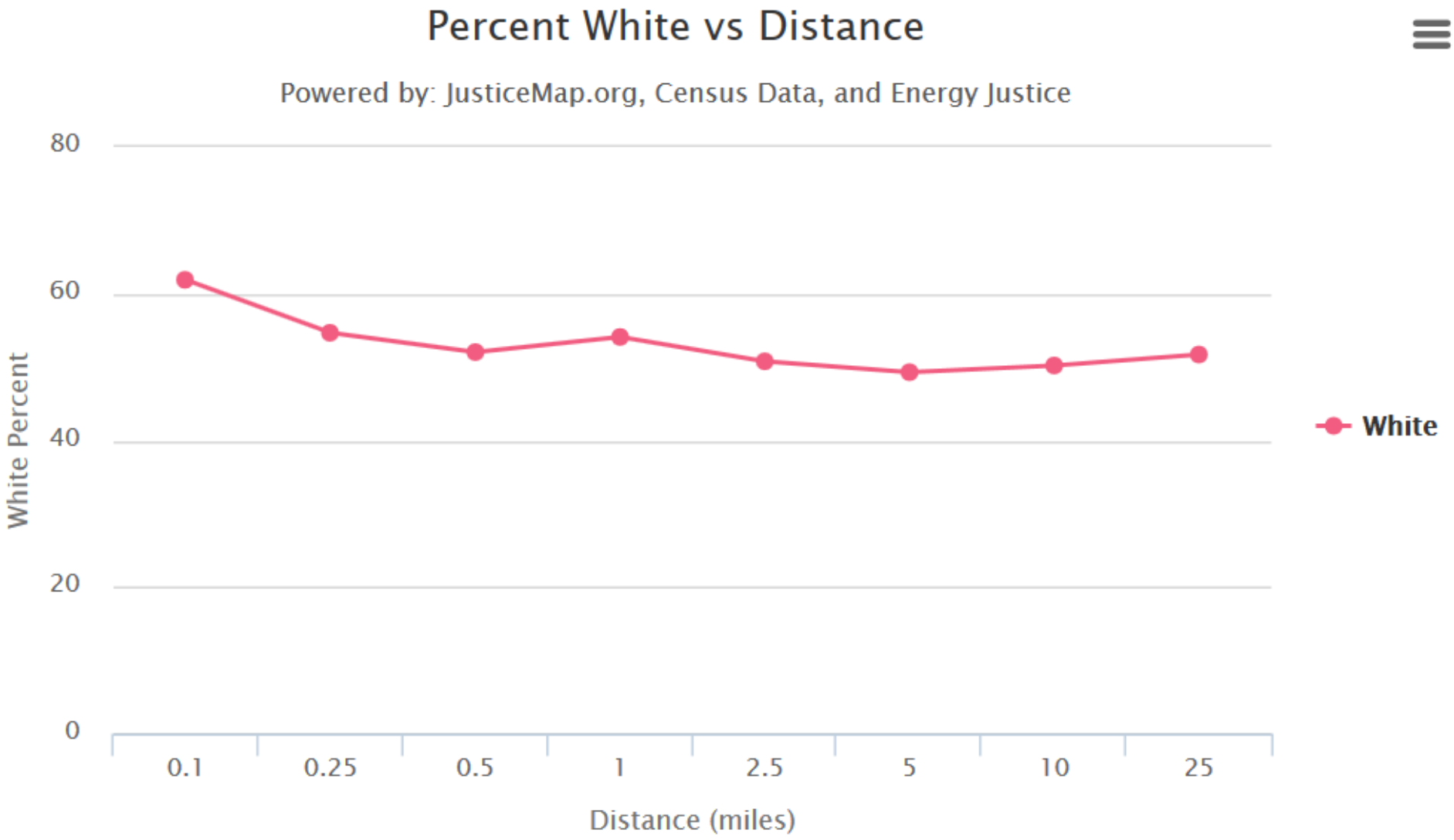

www.ChesterResidents.org

Who Lives Near Trash Incinerators?



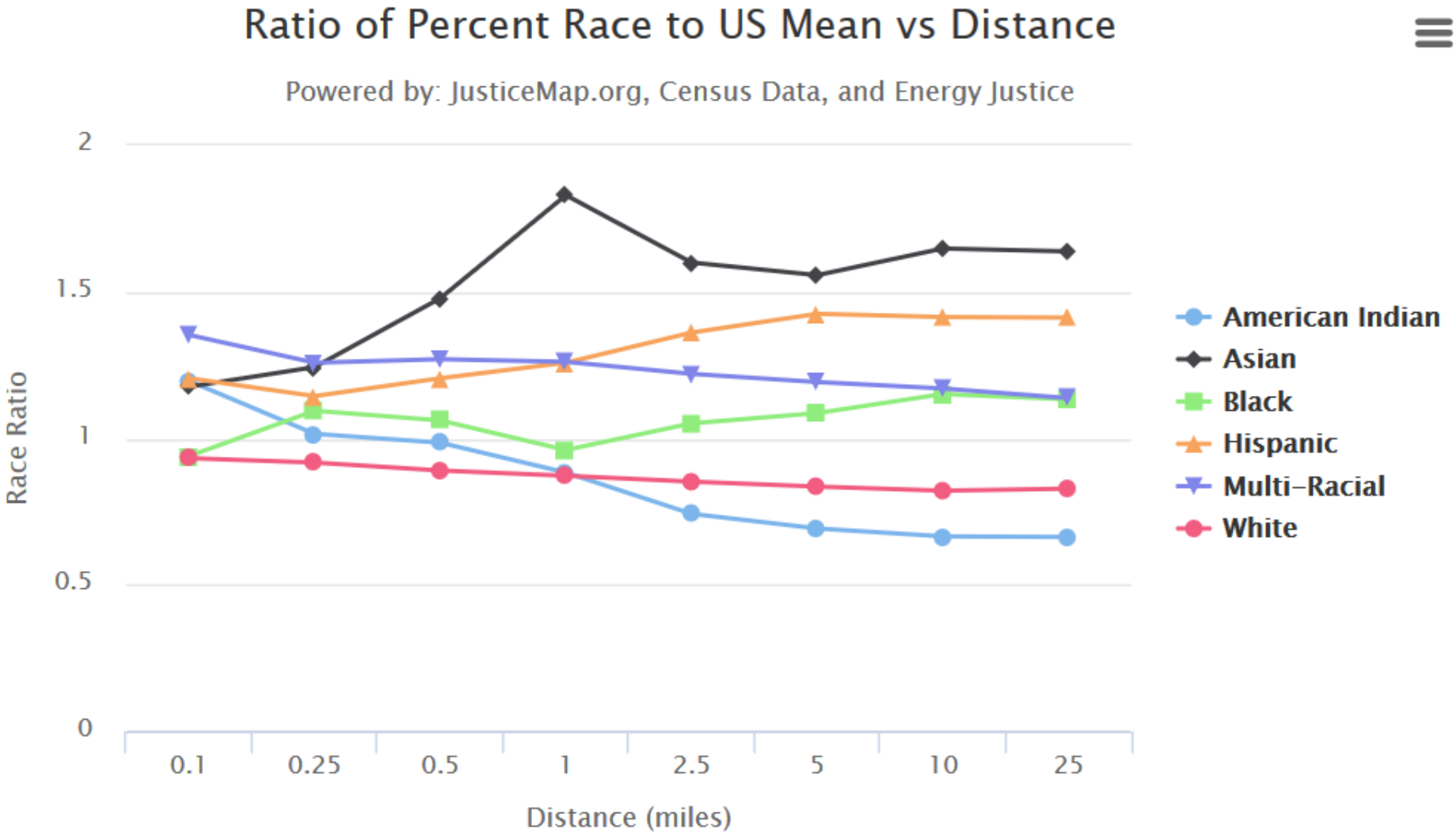
Source: www.spatialjusticetest.org/test/14.html

Who Lives Near Trash Incinerators?



Source: www.spatialjusticetest.org/test/14.html

Who Lives Near Landfills?



Source: www.spatialjusticetest.org/test/16.html

Zero Waste Jobs

Deconstruction Crew, Second Chance, Baltimore, MD. Photo Credit: C. Seldman

What is Zero Waste?

“The conservation of all resources by means of responsible production, consumption, reuse, and recovery of all products, packaging, and materials, without burning them, and without discharges to land, water, or air that threaten the environment or human health.”

Source: Zero Waste International Alliance, www.zwia.org

If you're not for Zero Waste, how much waste are you for?

Zero Waste means zero incineration and achieving 90% or greater diversion from landfills and other forms of destructive disposal.

The goal is to get as close to zero as possible, without getting caught up on the impossibility of actually hitting zero.

"Zero waste" is like "zero drug tolerance" or "zero accidents in the workplace" standards. Zero is the goal, and the right policies will get you as close as you can get.

Jan

Apr

Jul

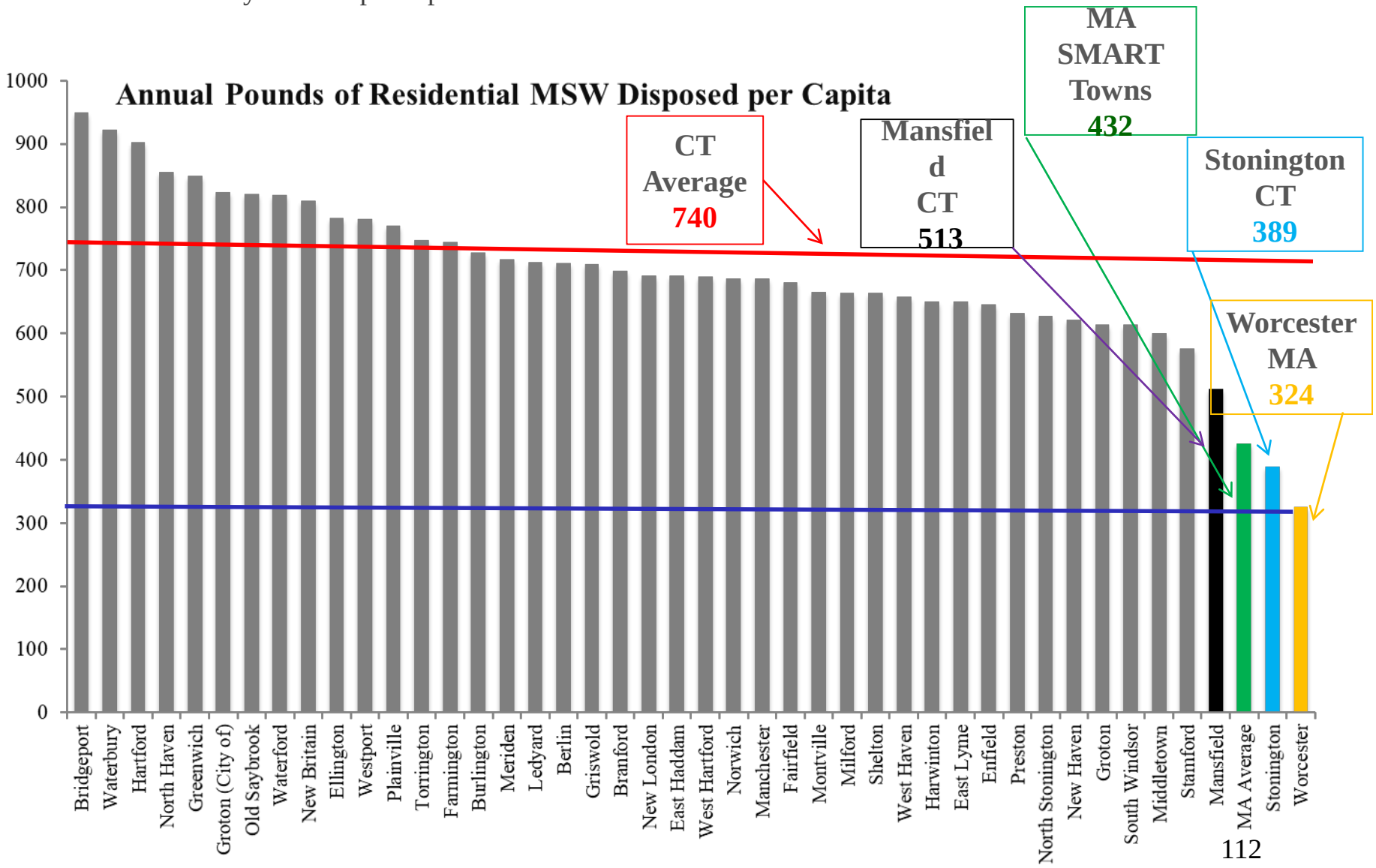
Oct

Getting to Zero Waste

- Unit pricing, a.k.a. “Pay/Save as You Throw” or “Save Money and Reduce Trash” (SMART)
- Free bins – and the right sizes!
- Composting
- Deconstruction

Residential MSW Disposed per Capita – DEEP Dive Participants

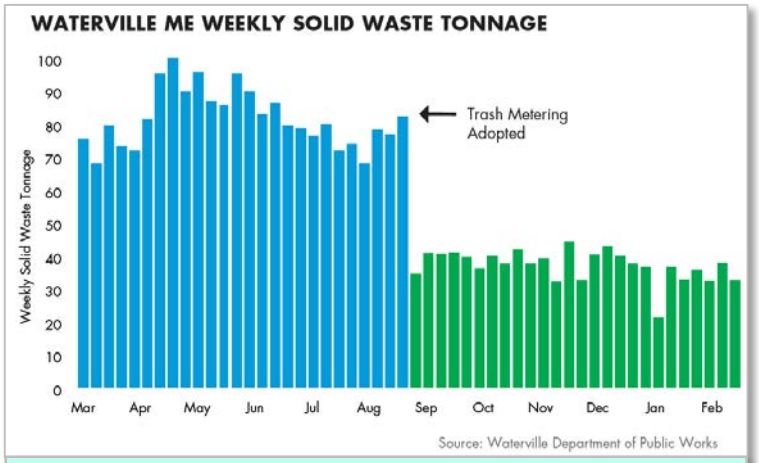
SMART communities dispose of less residential MSW per capita than most Connecticut cities and towns. Worcester throws away 324 lbs. per capita.



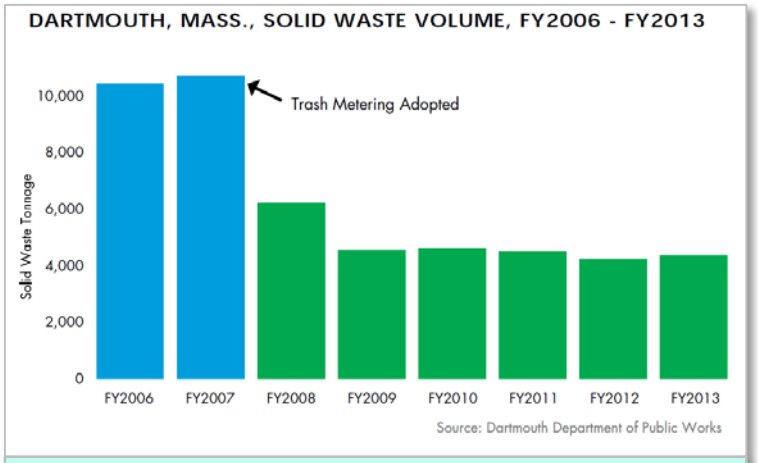
Note: Figures are calculated using MSW tonnage data provided by the municipalities themselves

Results: MSW Reduction of 44% on Average

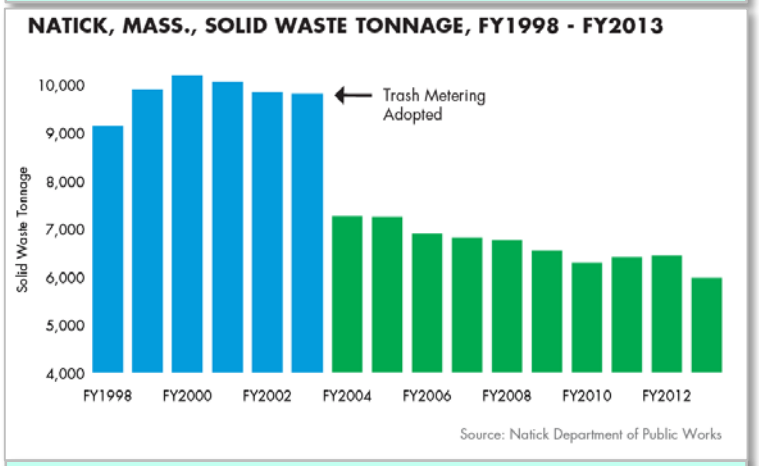
SMART / 'Unit Based Pricing' is a science. The data spans over decades across hundreds of municipalities with diverse demographics.



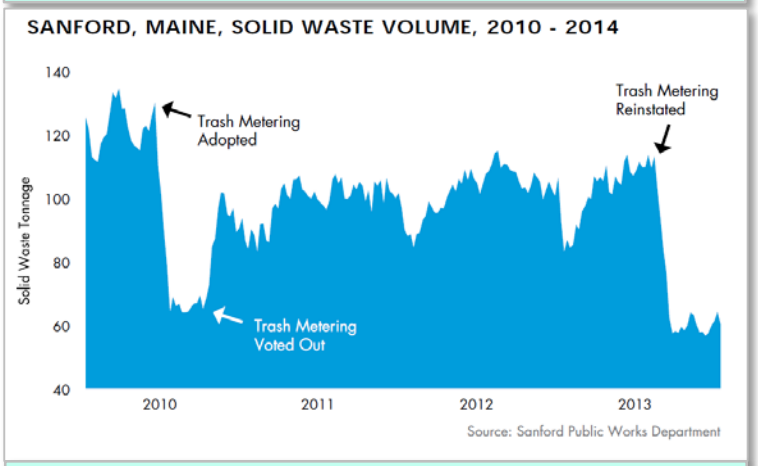
WATERVILLE, ME
53% DECLINE IN WASTE



DARTMOUTH, MA
59% DECLINE IN WASTE



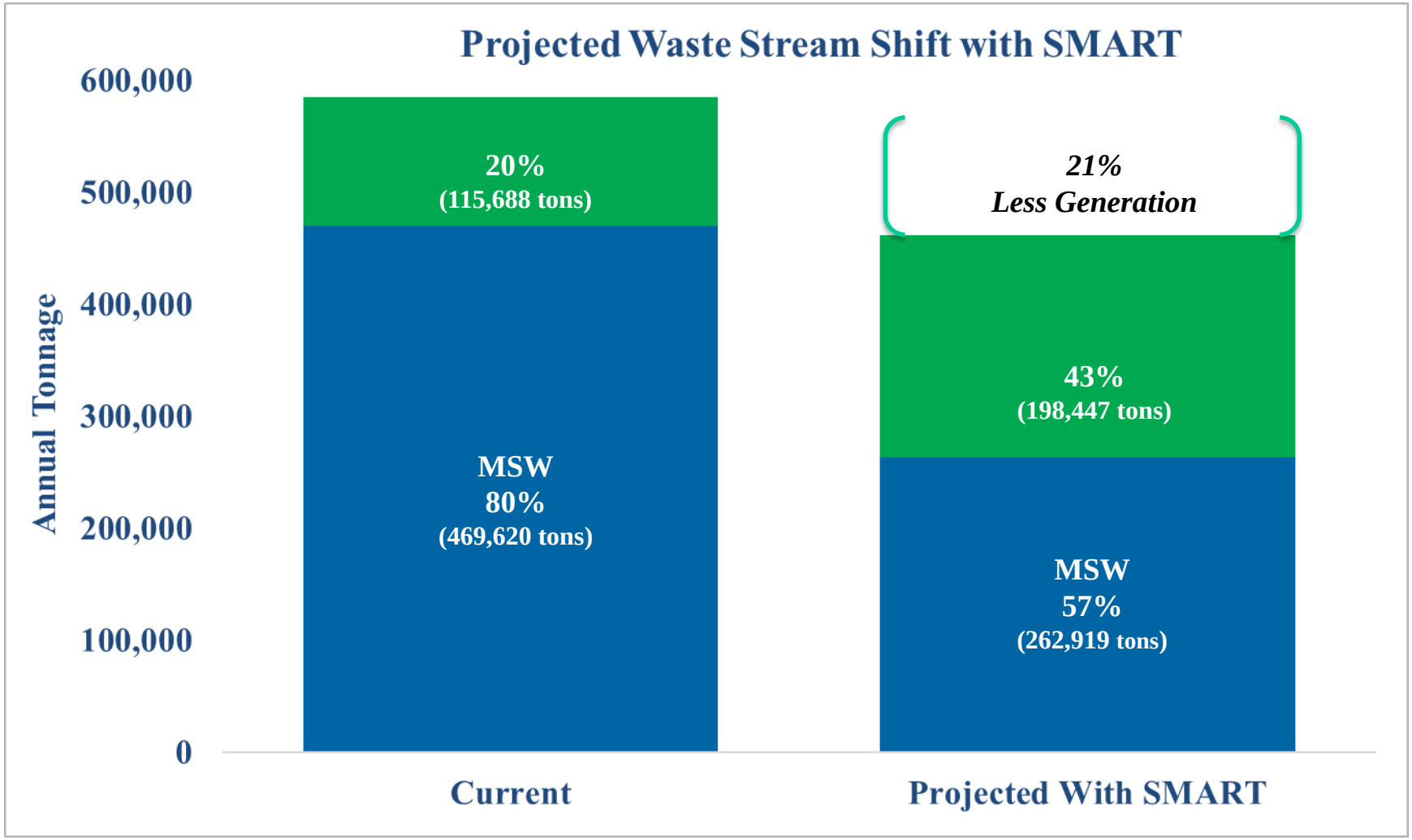
NATICK, MA
35% DECLINE IN WASTE



SANFORD, ME
40%+ DECLINE IN WASTE…TWICE

Expected Waste Shift from SMART (40 DEEP Dive Participants)

Overall waste generation is expected to decrease by about 21% due to source reduction and reuse.



Net Effect of SMART in Current Recycling Market (40 DEEP Participants)

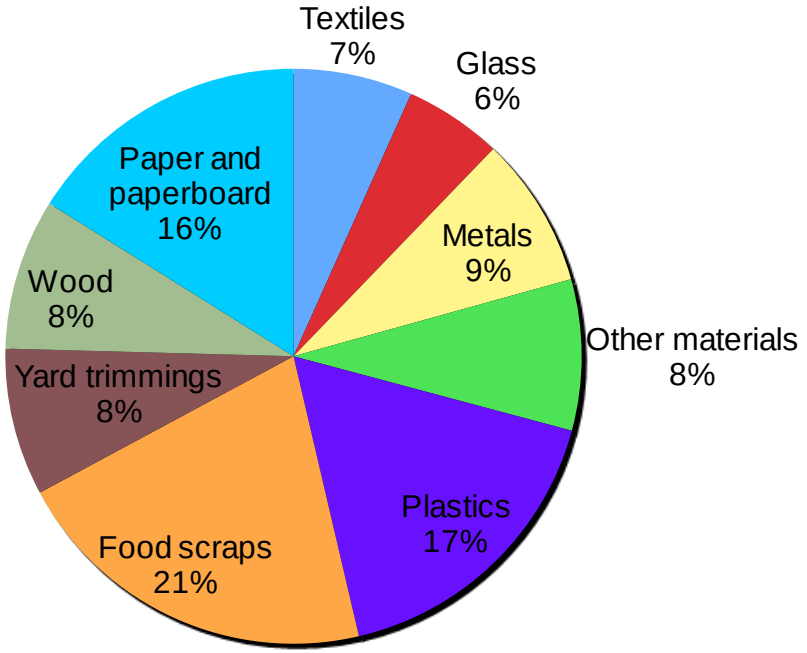
Recycling markets have been weak for the past few years due to a combination of single stream contamination and China's policy. The recycling infrastructure in the US is adjusting and markets are predicted to rebound. Recycling is a commodity and there will always be highs and lows. However, SMART is the best way to manage waste regardless of the recycling costs because it promotes source reduction and reuse. The recycling tip fee could go as high as $170 per ton, and a SMART system will still cost less money.

	No SMART	SMART	No SMART	SMART	No SMART	SMART	No SMART	SMART
Waste Tonnage	1,019,367	570,778	1,019,367	570,778	$1,019,367	$570,778	$1,019,367	$570,778
Recycling Tonnage	268,067	449,136	268,067	449,136	$268,067	$449,136	$268,067	$449,136
Waste Tip	$75	$75	$75	$75	$75	$75	$75	$75
Recycling Tip	**$0**	**$0**	**$40.00**	**$40.00**	**$80.00**	**$80.00**	**$170**	**$170**
Trash Disposal $	$76,452,541	$42,808,335	$76,452,541	$42,808,335	$76,452,541	$42,808,335	$76,452,541	$42,808,335
Recycling $			$10,722,665	$17,965,440	$21,445,331	$35,930,879	$45,571,328	$76,353,118
Total Cost	**$76,452,541**	**$42,808,335**	**$87,175,206**	**$60,773,774**	**$97,897,871**	**$78,739,214**	**$122,023,869**	**$119,161,453**
Savings - Comparison		**$33,644,206**		**$26,401,432**		**$19,158,658**		**$2,862,416**

The waste tip fee is expected to rise significantly over the next decade. The average waste tip fee for the 40 DEEP DIVE communities was $75 per ton. Most communities are tied to a CPI price escalator. Communities that have negotiated new contracts since the start of the program have seen much greater increases than CPI.

Money Thrown Away

$11.4 billion worth of recyclable packaging wasted (sent to landfills and incinerators) in 2010



Source: “Unfinished Business: The Case for Extended Producer Responsibility,” 2012 Report, www.asyousow.org/sustainability/eprreport.shtml

AUSTIN RESOURCE RECOVERY
MASTER PLAN
DECEMBER 15, 2011

ZERO WASTE BY 2040

The Austin City Council established three benchmark goals for achieving Zero Waste:

1. Reducing by 20 percent the per capita solid waste disposed to landfills by 2012
2. Diverting 75 percent of solid waste from landfills and incinerators by 2020
3. Diverting 90 percent of solid waste from landfills and incinerators by 2040

4

DIVERSION GOALS

The Master Plan establishes more aggressive milestones to ensure the City Council's benchmark goals are achieved.

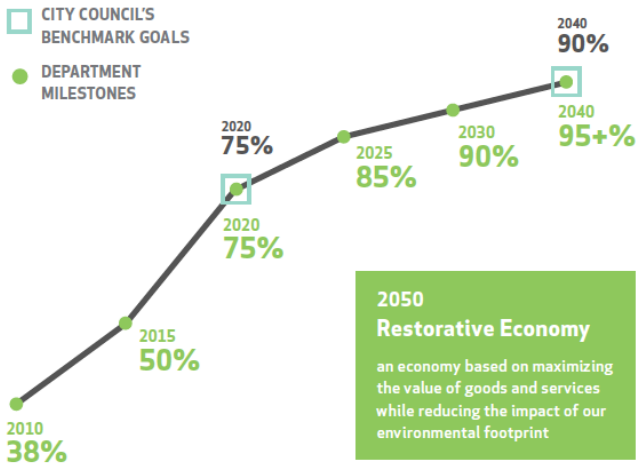
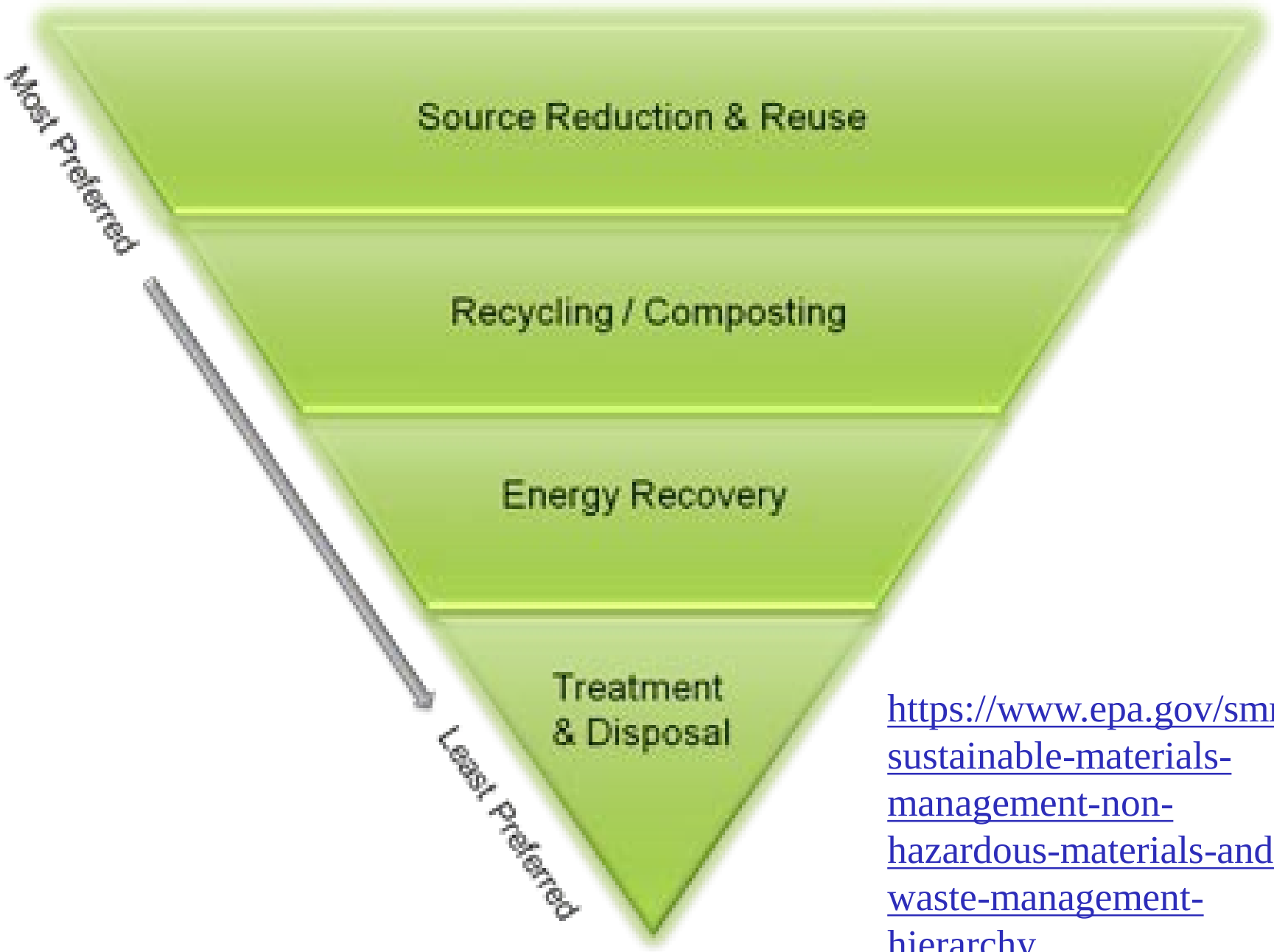


Table 1 - Projected Department Hauled Material Collection

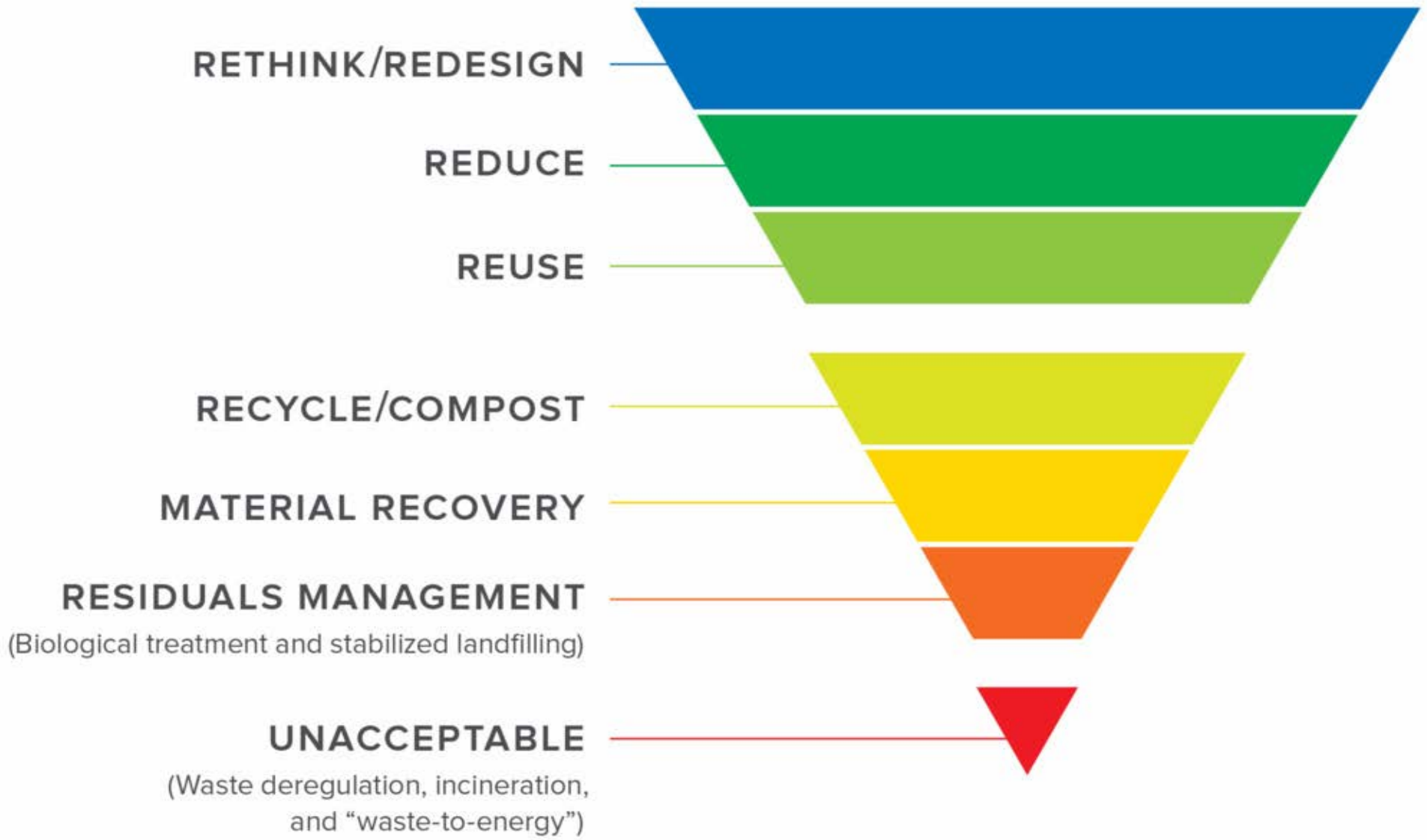
Department Hauled Collection	In Tons				
	FY 2010 (Actual)	FY 2015	FY 2020	FY 2025	FY 2030
Total waste disposal	138,757	115,000	68,000	49,000	37,000
Total diversion: reuse, recycling, organics, HHW	82,611	115,000	205,000	277,250	332,000
Total waste generation	221,368	230,000	273,000	326,250	369,000
Diversion rate	38%	50%	75%	85%	90%

EPA's Waste Management Hierarchy



https://www.epa.gov/smm/sustainable-materials-management-non-hazardous-materials-and-waste-management-hierarchy

THE ZERO WASTE HIERARCHY



www.zwia.org/zwh

Zero Waste Hierarchy

- Rethink / Redesign
- Reduce
- Source Separate:
  - **Reusables**
  - **Recycle** (multi-stream)
  - **Compost**
  - **Waste**
    - **Research** to see what is left, and encourage redesign
    - **Recovery**: mechanically remove additional recyclables
    - Anaerobically digest, then aerobically compost residuals
    - Stabilized (digested) residuals to landfill

www.energyjustice.net/zerowaste

The back end is still a landfill…

1. Direct landfilling
   (bad, but better than incineration)
   - leachate (toxics)
   - air emissions (toxics, methane, odors)

2. Incineration → toxic ash to landfill
   (most polluting and expensive option)
   - leachate (even more toxics)
   - air emissions from ash blowing off site (toxics)

3. Anaerobic digestion → landfill
   (best option; avoids gassy, stinky landfills)
   - odor, leachate and air emissions highly minimized

What is the best disposal option for the "Leftovers" on the way to Zero Waste?

By

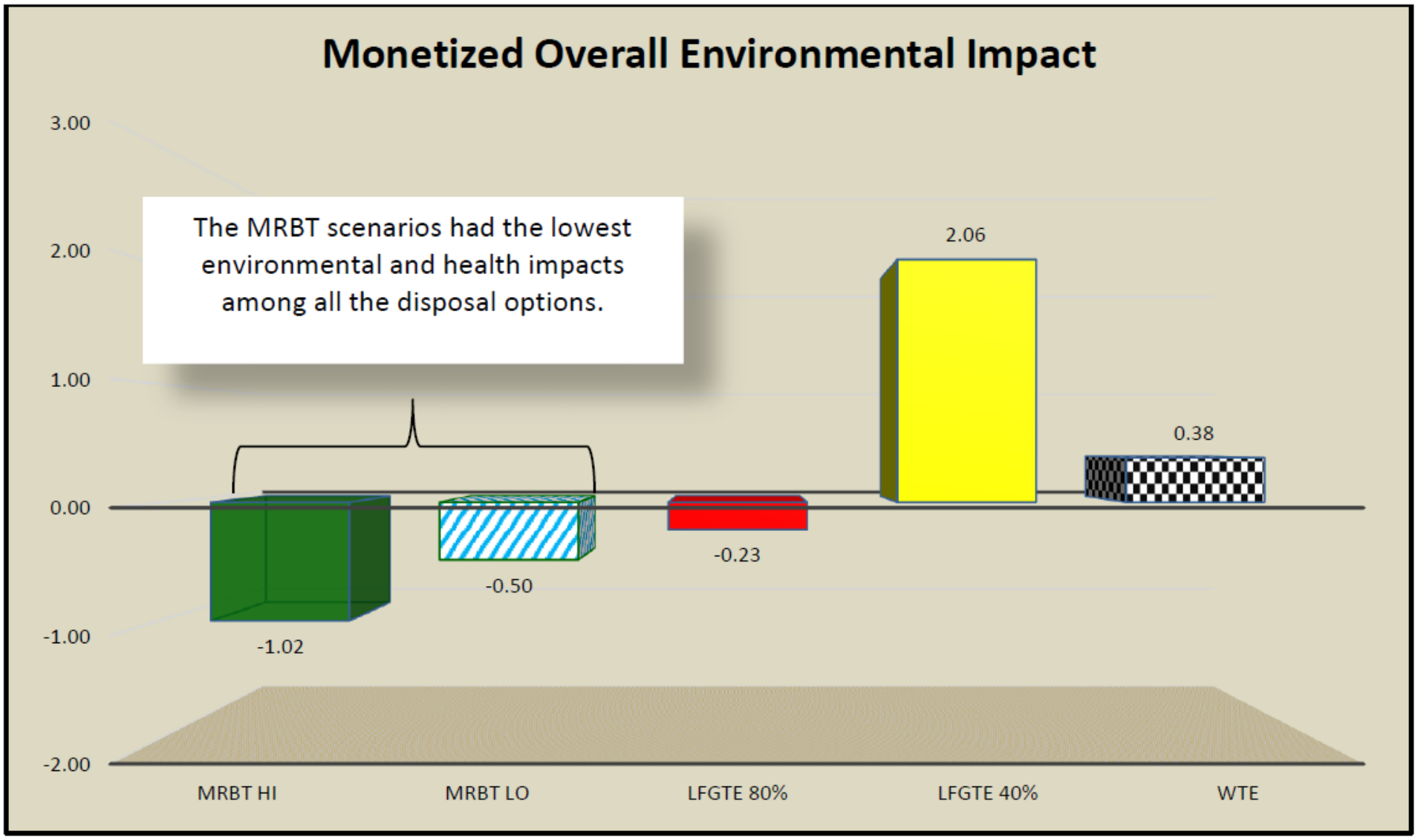
Dr. Jeffrey Morris

Dr. Enzo Favoino

Eric Lombardi

Kate Bailey

www.ecocycle.org/specialreports/leftovers


Monetized Overall Environmental Impact
The MRBT scenarios had the lowest environmental and health impacts among all the disposal options.
3.00
2.00
1.00
0.00
-1.00
-2.00
-1.02
-0.50
-0.23
2.06
0.38
MRBT HI
MRBT LO
LFGTE 80%
LFGTE 40%
WTE

Plastic & Climate

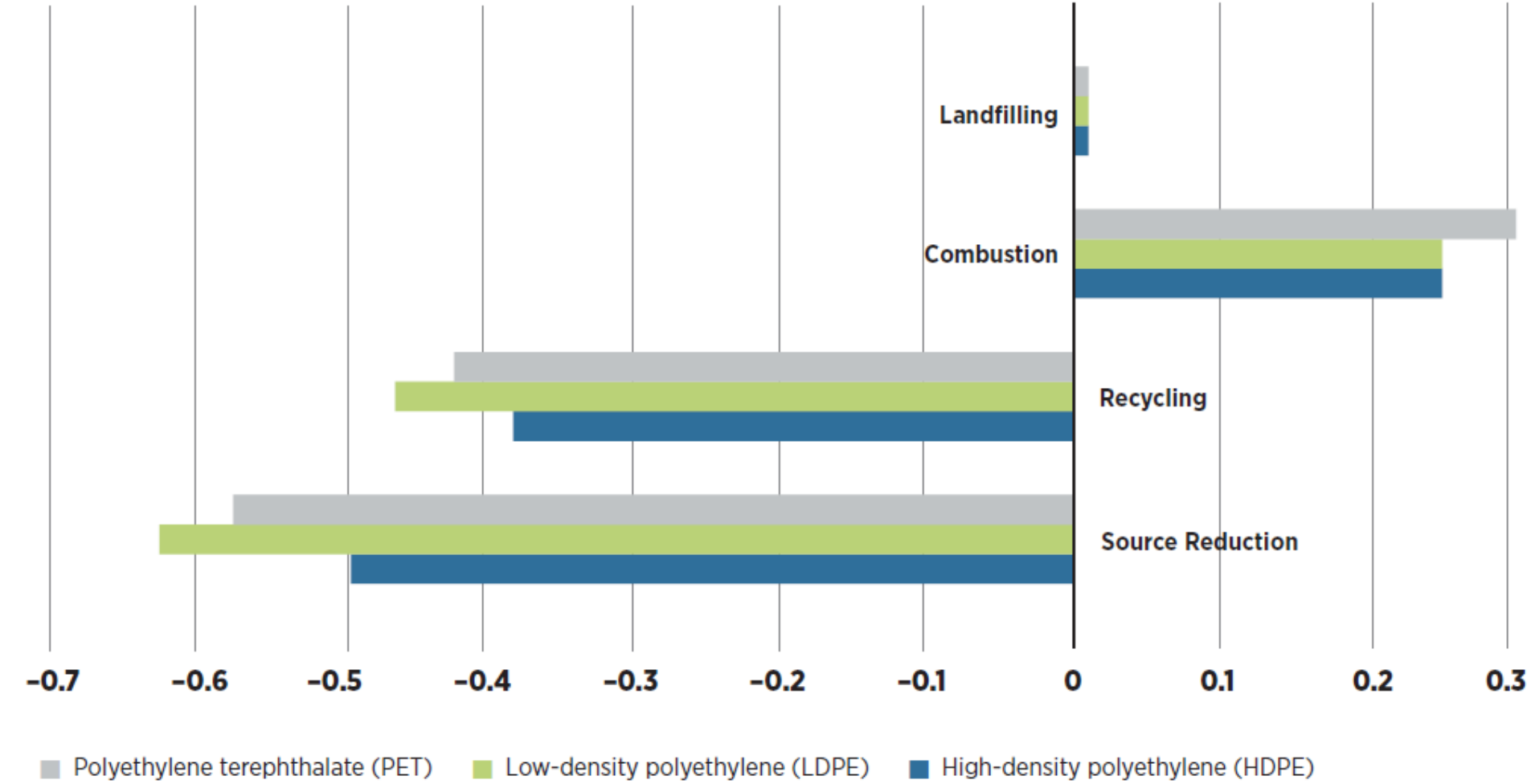
THE HIDDEN COSTS OF A PLASTIC PLANET

CIEL · EIP Environmental Integrity Project · FracTracker Alliance · gaia · 5 Gyres Science to Solutions · #breakfreefromplastic

Better to Landfill than Burn Plastics

FIGURE 16

Net Greenhouse Gas Emissions from Source Reduction and MSW Management Options



Unit: Mt CO_2e/ton

Source: U.S. EPA (2006). *Solid Waste Management and Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks Report.* Third edition.

Compostable Plastics

- Polylactic Acid (PLA)
  - Made from biotech corn
  - Glyphosate (Roundup) spraying
    - Cancer; kills / mutates amphibians
  - Estrogen-like chemical leaching
- Consumers confused where to put it
  - Recycling:
    - Contaminates recycling
  - Composting:
    - Often not available, consumers don't know if going to industrial facility that can handle it
  - Trash:
    - Worse than plastics in landfill; both bad if burned

Messing with your hormones…

Mother Jones

POLYSTYRENE (PS) #6

Characteristics: Known by the brand name Styrofoam; contains styrene, which may mimic estrogen

Uses: Takeout containers, egg cartons, meat and fish trays

Positive: 50 percent

POLYCARBONATE (PC) #7

Characteristics: Hard, clear, durable; contains BPA

Uses: Dishes, drinking glasses, reusable water bottles, food packaging, blenders, syringes

Positive: 100 percent

POLYLACTIC ACID (PLA) #7

Characteristics: Made from corn; marketed as biodegradable and compostable

Uses: Takeout containers, fruit and vegetable packaging, yogurt cups, disposable utensils

Positive: 91 percent

Source: www.motherjones.com/environment/2014/03/guide-estrogen-common-plastics-bpa/; more at www.ejnet.org/plastics

For more Info…

- Incineration:
  - www.EnergyJustice.net/incineration
  - www.EnergyJustice.net/biomass
- Landfills and Landfill Gas Burning:
  - www.EnergyJustice.net/lfg
  - www.ejnet.org/landfills
- Zero Waste:
  - www.EnergyJustice.net/zerowaste
  - www.ilsr.org/initiatives/waste-to-wealth
  - www.grrn.org/zerowaste
  - www.zwia.org

Energy Justice Network

www.EnergyJustice.net

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