Appliance Standards

Metropolitan Washington Council of Governments
Air and Climate Public Advisory Committee

November 13, 2023 Sierra Club Presentation

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Appliance Pollution Standards

1. What are appliance standards?
2. State standards landscape
3. EPA petition & SIP inclusion

What are appliance standards?

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What are appliance standards?

Appliance standards are a regulatory solution to the air pollution from buildings.

The majority of direct emissions from the buildings sector comes from fossil fuel combustion in heating equipment, including HVACs, furnaces, boilers, water heaters, stoves, and dryers.

What about efficiency standards?

Efficiency Standards

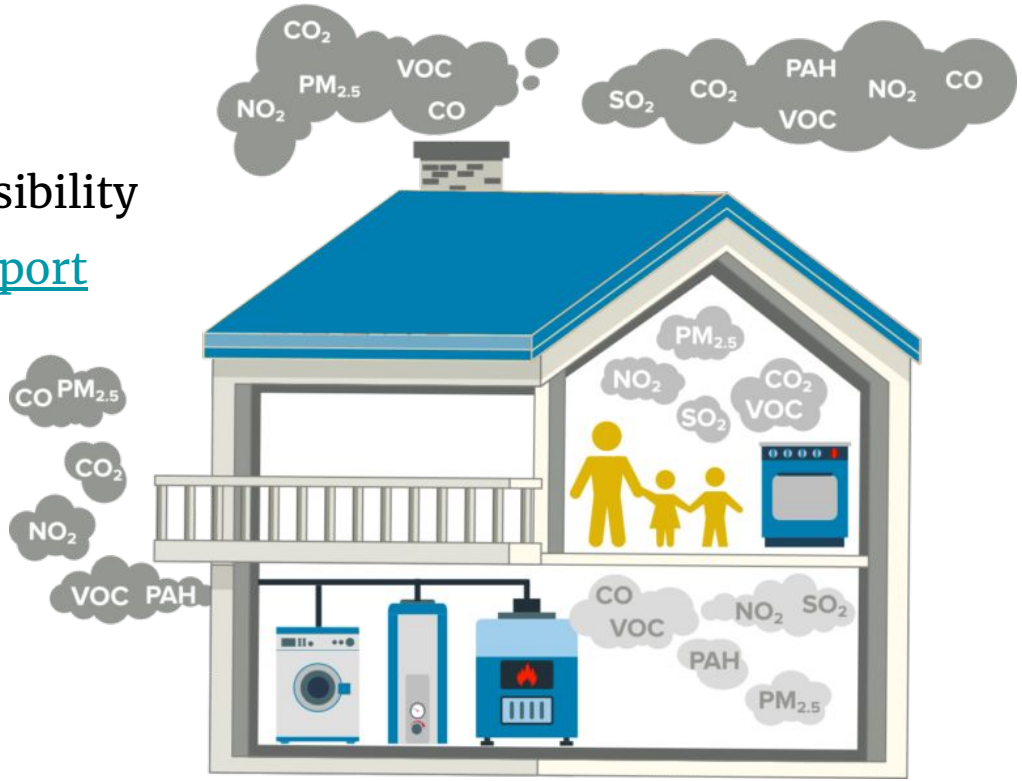
- Targets energy use and efficiency
- Legally cannot get us to zero-emissions

Pollution Standards

- Directly target and reduce the pollution from appliance use
- Can be used to get to ZERO emissions and require a transition to zero-emission (electric) technology

Building Sector Pollution

Sierra Club, WE ACT for Environmental Justice, and Physicians for Social Responsibility (PSR) recently published a report about how burning fossil fuels results in outdoor emissions of health harming and climate disrupting pollution.



2017 National Building Pollution

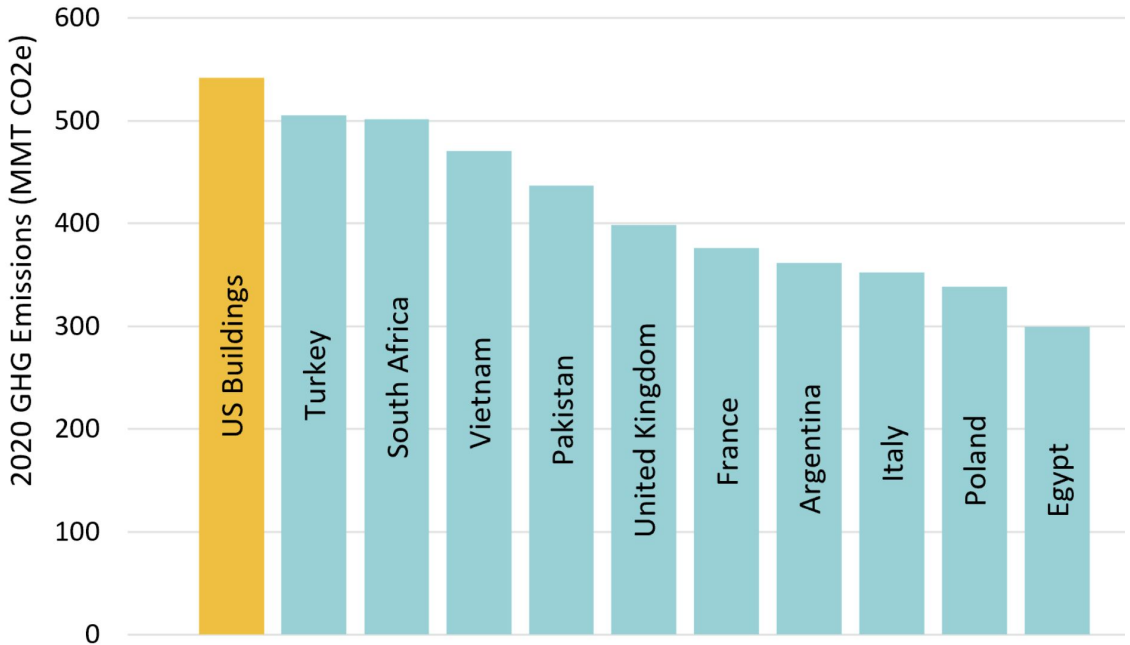
2017	Residential Buildings	Comm./Institutional Buildings	Buildings Total
Nitrogen Oxides (NOx)	269,963 tons (2.8% of total NOx)	191,1127 tons (2% of total NOx)	**461,090 tons (4.9% of total NOx)**
Carbon Monoxide (CO)	106,894 tons	143,202 tons	250,096 tons
Particulate Matter (PM2.5)	7,566 tons	7,733 tons	15,299 tons
Carbon Dioxide (CO2)	293 MMT (4.5% of total CO2)	232 MMT (3.5% of total CO2)	**525 MMT (8% total CO2)**

2020 National Building Pollution

2020	Residential Buildings	Comm./Institutional Buildings	Buildings Total
Nitrogen Oxides (NOx)	**280,919 tons (3.6% of total NOx)**	**200,019 tons (2.6% of total NOx)**	**480,938 tons (6.2% of total NOx)**
Carbon Monoxide (CO)	**112,492 tons**	**148,505 tons**	**260,997 tons**
Particulate Matter (PM2.5)	6,058 tons	**7,837 tons**	13,895 tons
Carbon Dioxide (CO2)	**313 MMT (5.2% of total CO2)**	**233 MMT (3.8% of total CO2)**	**542 MMT (9% total CO2)**

Carbon Dioxide (CO_2)

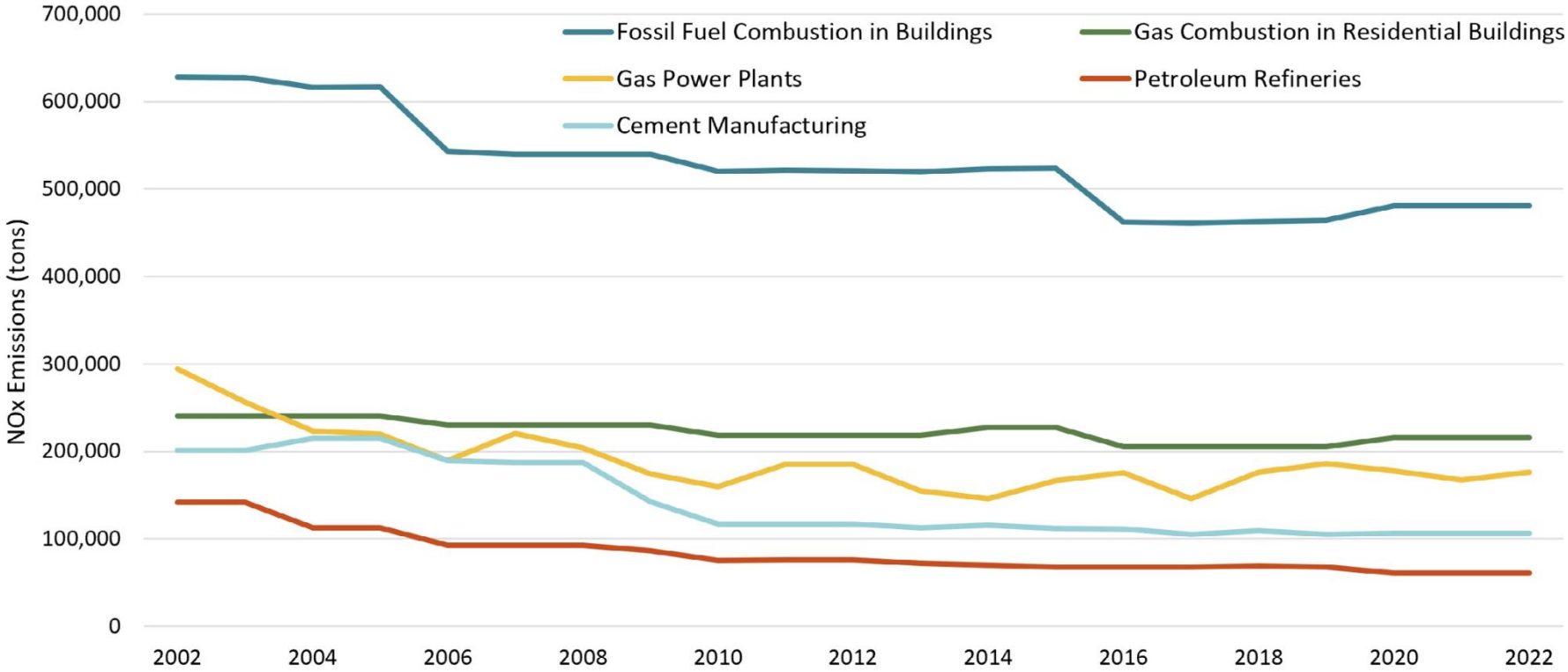
US Buildings v. Total Emissions from Other Countries



Key takeaways:

- Fossil fuel combustion in buildings in the United States is responsible for **9% of our total greenhouse gas pollution**.
- Unlike the other primary sectors responsible for climate disrupting pollution, pollution from buildings is **almost entirely unregulated**.
- Direct pollution from just the buildings sector in the United States exceeded the all-sector GHG pollution of 179 countries in 2020.

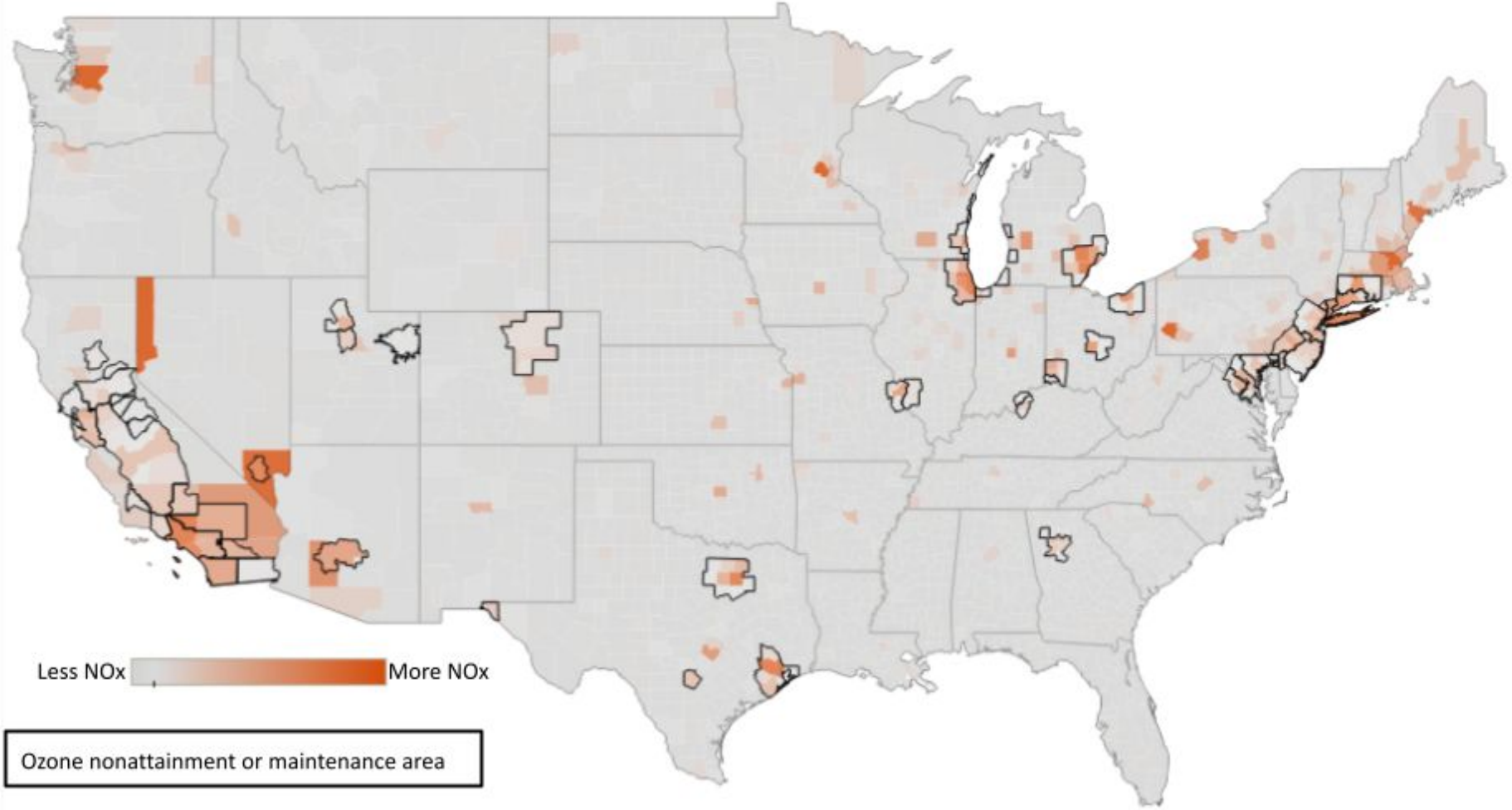
Nitrogen Oxides (NO_X)



Precursor to Ozone & Smog

After being emitted into the atmosphere, **NOx reacts with other pollutants**, namely, volatile organic compounds (VOCs), in the presence of heat and sunlight **to form ground-level ozone**, the primary ingredient of smog.

NOx Pollution from Fossil Fuel Combustion in Buildings and Ozone Nonattainment/Maintenance Areas



Health Impacts from Building Pollution

Pollutant	Health Effects	
	Short-Term Exposure	Long-Term Exposure
Nitrogen Oxides (NOx)	Decreased lung function, asthma exacerbation, respiratory infection, stroke	Premature mortality, cancer, cough, shortness of breath, asthma, wheezing, respiratory illness in children
Carbon Monoxide (CO)	Death, brain damage, seizures, memory loss, dementia, headaches, dizziness, nausea	Brain and heart toxicity, heart failure and cardiovascular disease, low birth weight
Particulate Matter (PM2.5)	Stroke, increased blood pressure	Cancer, asthma and bronchitis in children, damages to respiratory system, headaches, sleep disorders, memory loss, birth defects

Disproportionate Impacts

While the harms caused by building pollution are felt broadly across communities, exposure to pollution disproportionately impacts **environmental justice communities** and **vulnerable demographic groups**.

Children, low-income communities, communities of color, renters, and the elderly all face uniquely difficult challenges in polluted environments and are often subject to the cumulative impacts of overlapping hazards.

Disproportionate Impacts

Communities of Color

- Exposed to higher levels of pollution overall
- More likely to have pre-existing conditions
- Cumulative health impacts of systemic racism

Low-Income + Renters

- Renters more likely to live in small units, multifamily
- Barriers to weatherization programs
- Less control over/access to upgrades

Children + Elderly

- Multiple physical attributes increase vulnerability
- Older people more likely to have pre-existing conditions

Asthma

- Children living in a home with a gas stove are 42% more likely to have asthma
- Disproportionately affects Black children, Black and Indigenous adults

Communities of Color

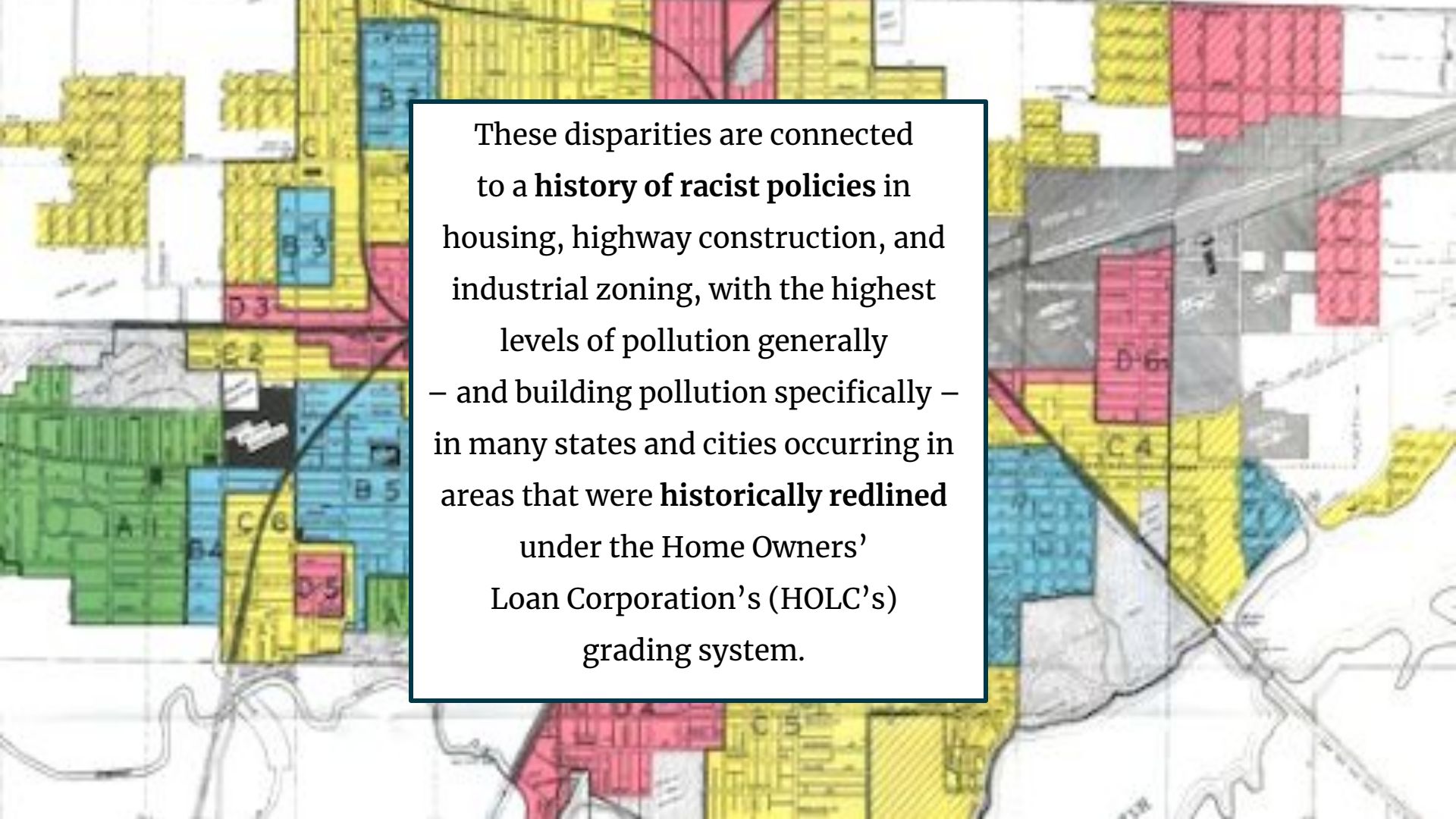
Nationally, communities of color are exposed to **twice as much outdoor $PM_{2.5}$ pollution** from residential gas combustion as white communities and experience levels of **NO_2 exposure that are 38% higher** than white communities.

National Patterns in Environmental Injustice and Inequality: Outdoor NO_2 Air Pollution in the United States

Lara P. Clark[1], Dylan B. Millet[1,2], Julian D. Marshall[1]*

$PM_{2.5}$ polluters disproportionately and systemically affect people of color in the United States

Christopher W. Tessum[1]*, David A. Paolella[2†], Sarah E. Chambliss[3], Joshua S. Apte[4,5], Jason D. Hill[6], Julian D. Marshall[2]



These disparities are connected to a **history of racist policies** in housing, highway construction, and industrial zoning, with the highest levels of pollution generally – and building pollution specifically – in many states and cities occurring in areas that were **historically redlined** under the Home Owners' Loan Corporation's (HOLC's) grading system.

State Standards Landscape

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California Air Regulatory Board (CARB)

CARB State Implementation Plan: Unanimous adoption of SIP that includes **2030** zero-emissions standard for **residential** ***and*** **commercial** space and water heaters.

Implementation (rulemaking process) by 2025

CARB explicitly acknowledged standards are part of a suite of equity policies and has committed to deep collaboration to develop the rules.

Bay Area Air Quality Management District (BAAQMD)

BAAQMD has regulated NOx emissions from gas furnaces since 1983 and gas water heaters since 1992.

Point of sale emissions standards:

2021 - proposed zero-NOx standards

Residential water heaters- 2027

Residential furnaces - 2029

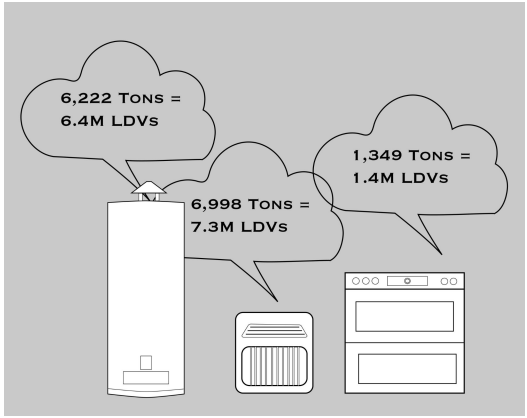
Commercial space and water heaters - 2031

2022 - Environmental Impact Statement

85 premature deaths, 3000+ asthma attacks, $890 million in health impacts avoided annual = NOx emissions of passenger vehicles in BA

March 2023 - 22-0 board vote in favor after 600+ public comments

July 2023 - rule submitted to SIP



Implementation

50+ member Implementation Working Group

Bay Area Clean Air Coalition working in parallel on "Plan of Action" addressing tenants rights, cost-competitiveness, labor standards, contractor trainings, etc.

South Coast Air Quality Management District (SCAQMD)

South Coast AQMD has regulated NOx emissions from gas furnaces since 1978 and from gas water heaters since 1998.

10+ rules delineated in 2022 Air Quality Management Plan

2023 - Commercial Ovens, Commercial Water Heaters

2024 - Residential Space and Water Heaters, Commercial Dryers

Issues - "low-emissions" alternatives, mitigation fees, timelines, cost-effectiveness

Colorado

In June 2023, Governor Polis signed HB23-1261 Environmental Standards for Appliances into law!

The crafting of HB23-1161 was led by Southwest Energy Efficiency Project and became one of CO Sierra Club's priority bills. Here is a factsheet and FAQ. The bill

- Updates existing appliance standards laws with new energy and water efficiency standards.
- Phases out mercury-containing light bulbs.
- **Lowers the allowable NOx emissions for gas heating and water appliances, including furnaces, boilers, and water heaters, starting in 2026.**
- By 2030, requires the Air Quality Control Commission to promulgate various rules lowering emissions limits.

State Implementation Plans

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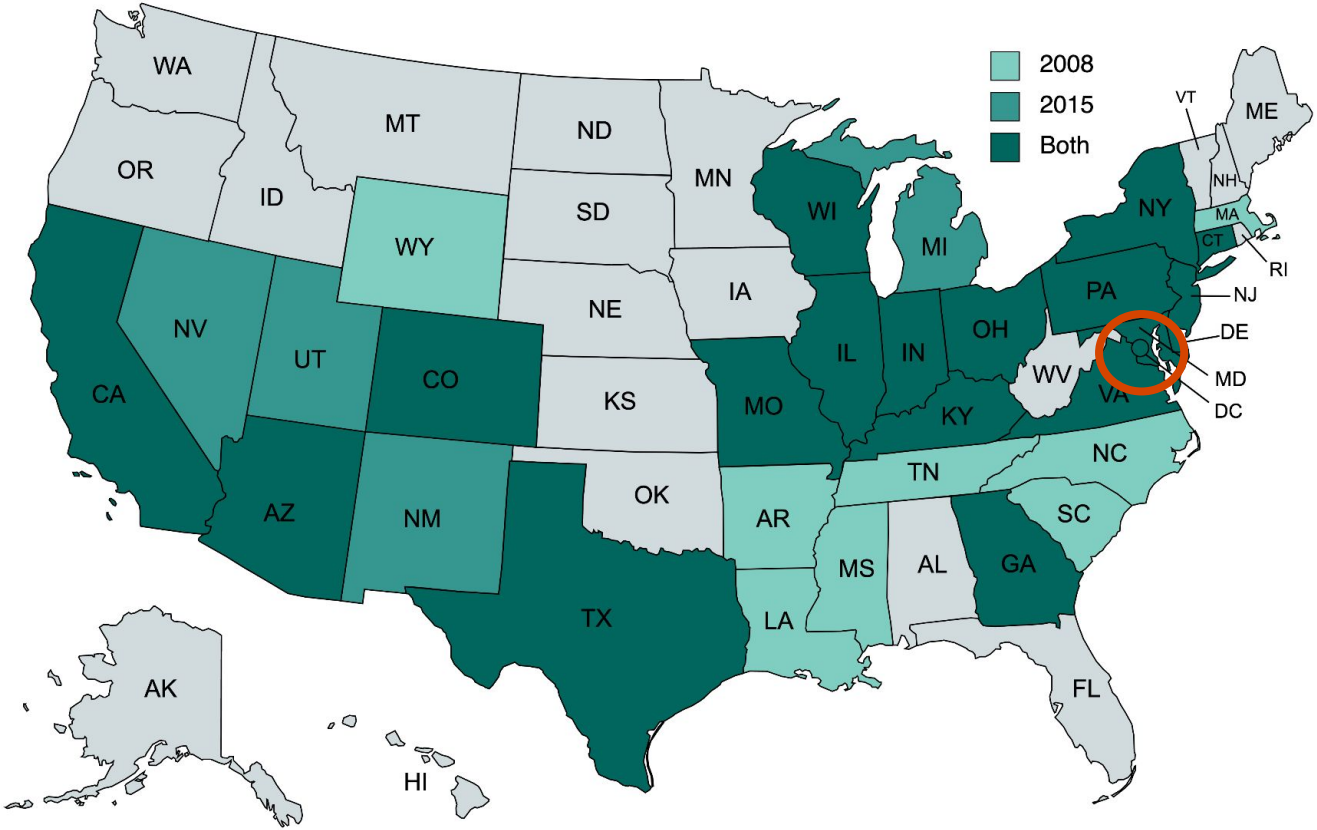
What is a State Implementation Plan?

- Collection of laws and regulations used by state or local air district to **fulfill requirements of the federal Clean Air Act.**
- Clean Air Act requires US EPA to set national ambient air quality standards (NAAQS) for six criteria pollutants (ozone, PM, CO, lead, SO2, NO2) and update those periodically.
- Authority to ensure NAAQS are met is delegated to the states → SIPs are how they do it

Appliance Emissions Standards in SIPs

- California's two largest Air Quality Management Districts have regulated NOx emissions from gas-fired appliances for decades.
- Texas has regulated NOx emissions from water heaters since 2000; Utah since 2015.
- EPA approved SIP revisions incorporating these regulations for California and Texas (proposed approval for Utah).
- Region 9 proposed disapproval of San Joaquin Valley SIP.

States with Ozone Nonattainment & Maintenance Areas



Ozone NAAQS

- Current standard (2015): 70 ppb
- 2008: 75 ppb
- 1997: 80 ppb (8-hour)
- 1979: 120 ppb (1-hour)

Nonattainment Area Reclassifications

- Areas failed to attain **2015** ozone standard by 2021 deadline reclassified as moderate: CA, CO, CT, MD, MI, PA/MD/DE, NV, IL, WI, MO, TX, KY, OH, UT, AZ
- Revised SIPs and control measures were due **Jan 1, 2023**
- Attainment by **August 3, 2024**
- Public comment opportunity when state proposes changes and/or when EPA proposes to approve or disapprove SIP revisions

Nonattainment Area Reclassifications

- Areas failed to attain **2008** ozone standard by 2021 deadline reclassified as severe: CA, CO, NY/NJ/CT, TX
- Revised SIPs due **May 2024**
- Control measures implemented by **Nov 2025**
- Attainment by **July 2027** (based on 2024-26 ozone season)

Connecticut SIP Revision Comments

- State should limit NOx emissions from new residential and commercial appliances (furnaces, water heaters, boilers).
- Modelling shows significant contribution to nonattainment of ozone NAAQS in the state.
- Focused on EJ impacts of building emissions.
- Pointed to California, Texas, Utah examples.
- Zero-emission electric appliances are readily available.

EPA Petition

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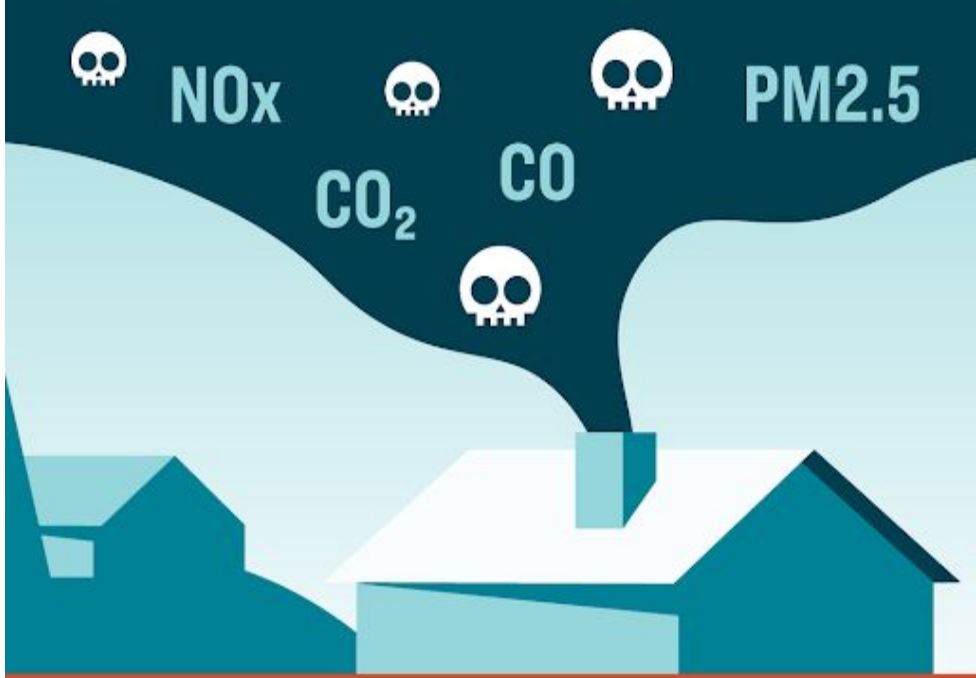
EPA Petition

Clean Air Act, Section 111(b)

1) List "fossil fuel-fired heating appliances" as a category of stationary sources
2) that "cause, or contribute significantly to, air pollution
3) which may reasonably be anticipated to endanger public health or welfare,
4) and set zero-emission (zero-NOx) performance standards for the appliances in the category manufactured after 2030.



111(g) Governor Petition

111(g)(2) Upon application of the Governor of a State, showing that any category of stationary sources which is not included in the list under subsection (b)(1)(A) contributes significantly to air pollution which may reasonably be anticipated to endanger public health or welfare (notwithstanding that such category is not a category of major stationary sources), the Administrator shall revise such regulations to specify such category of stationary sources.

Questions

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Appendix

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What do they look like?

How do you set standards for appliances?

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Regulated Entity

A person **shall not sell, install or offer for sale** within the District any stationary residential natural gas-fired fan type central furnace **manufactured after** January 1, 1984 that emits more than 40 nanograms of oxides of nitrogen expressed as NO2 per joule of useful heat delivered to the heated space….

Certification: The **manufacturer** shall have each appliance model tested in accordance with the following…

Compliance Statement: The **manufacturer** shall submit to the APCO a statement that the model is in compliance with this Rule…

[Excerpts from the 1984 BAAQMD Furnace Rule]

Nanograms of NOx per Joule

Jurisdiction	Rule	GAS FURNACES	Limit
CA BAAQMD	Rule 9-4	<175,000 Btu/hr	40 ng NOx/J
CA SCAQMD	Rule 1111	<175,000 Btu/hr	14 ng NOx/J

40 ng NOx/J = “Low NOx”
14 ng NOx/J = “Ultra Low NOx”

Nanograms of NOx per Joule

Jurisdiction	Rule	WATER HEATERS & BOILERS	Limit
BAAQMD	Rule 9-6	Gas Water Heaters (GWH) <75,000 Btu/hr Gas Water Heaters & Boilers (GWH&B) 75,000-2,000,000 Btu/hr	10 ng NOx/J 14 ng NOx/J
Utah	Utah Admin. Code R307-230-5 / Utah Code 15A-6-102	GWH <75,000 Btu/hr GWH 75,000-2,000,000 Btu/hr Gas Mobile Home Water Heater	10 ng NOx/J 14 ng NOx/J 40 ng NOx/J
Texas	30 Tex. Admin. Code § 117.3200 to .3215	GWH&B <75,000 Btu/hr GWH&B 75,000-400,000 Btu/hr GWH&B 400,000-2,000,000 Btu/hr	10 ng NOx/J 40 ng NOx/J 0.037 lbs NOx/MBtu

Zero-NOx Phase-In

Send a market signal to manufacturers, retailers, contractors, installers, and consumers

Transition period

Low/Ultra Low NOx
or
Fleetwide averaging

All new manufactured space and water heating equipment is zero-emission (all electric)

→ simultaneous advocacy for increased retrofit funding for low-income communities →

So what’s the solution?

Zero-Emission Alternative: Heat Pumps!

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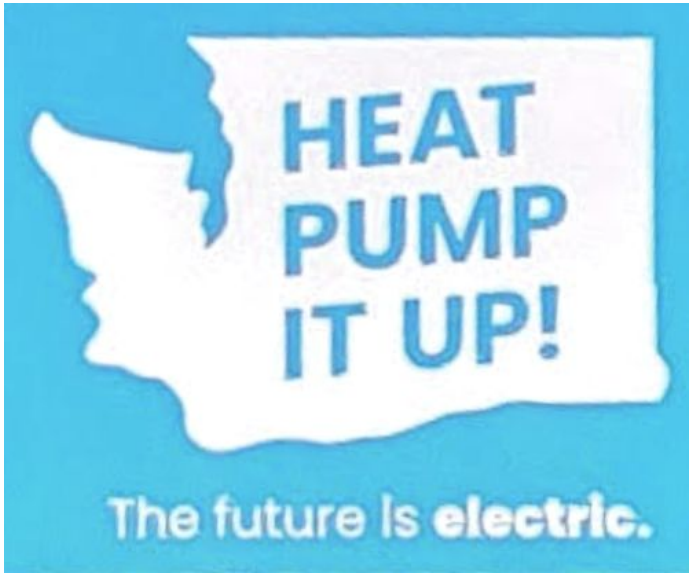
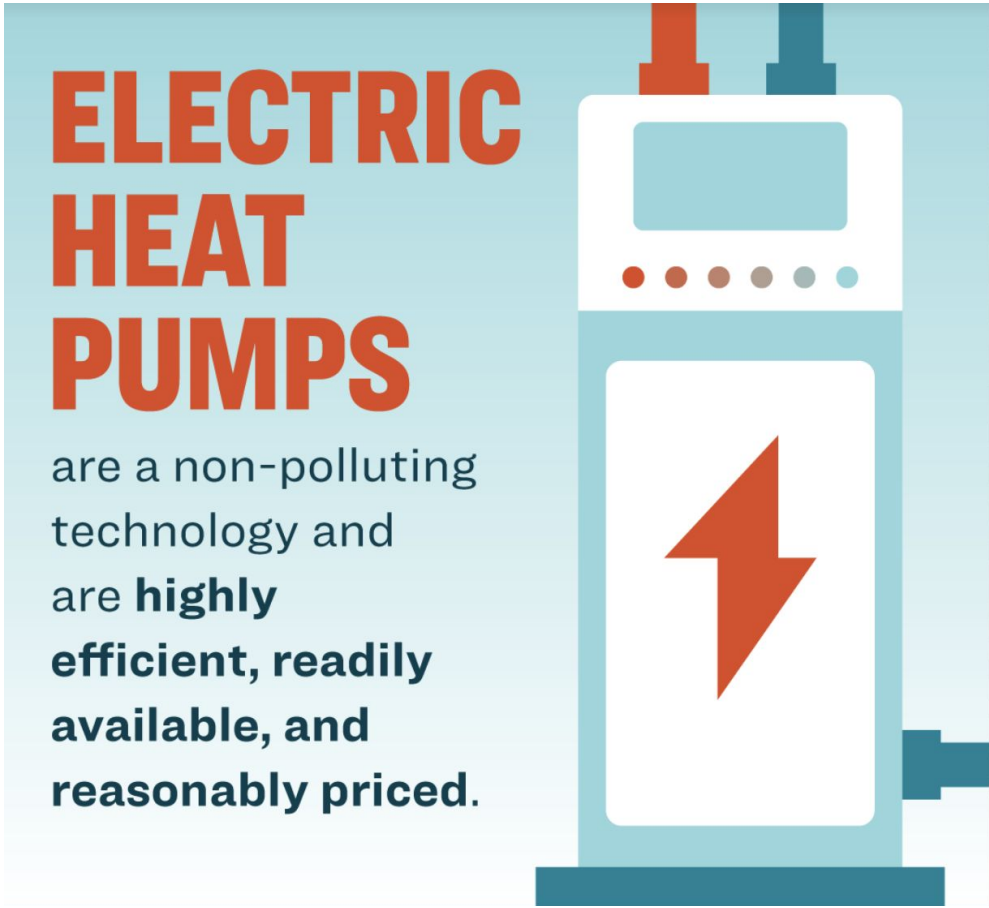
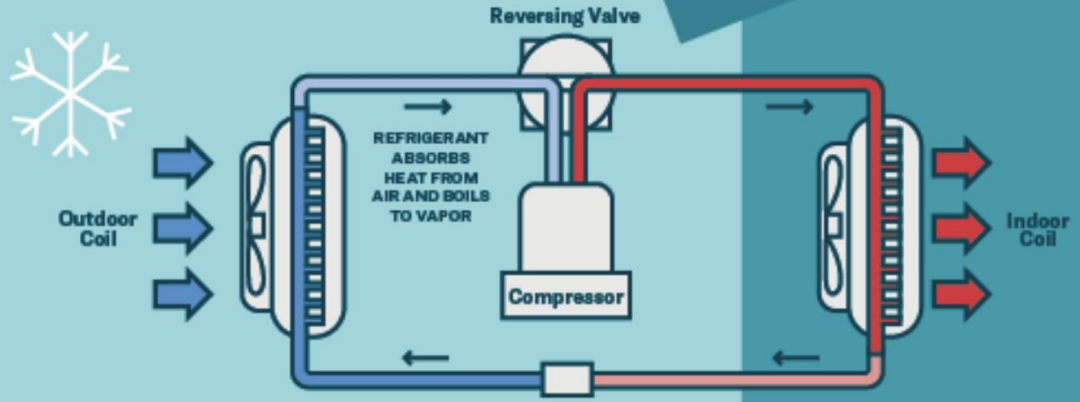
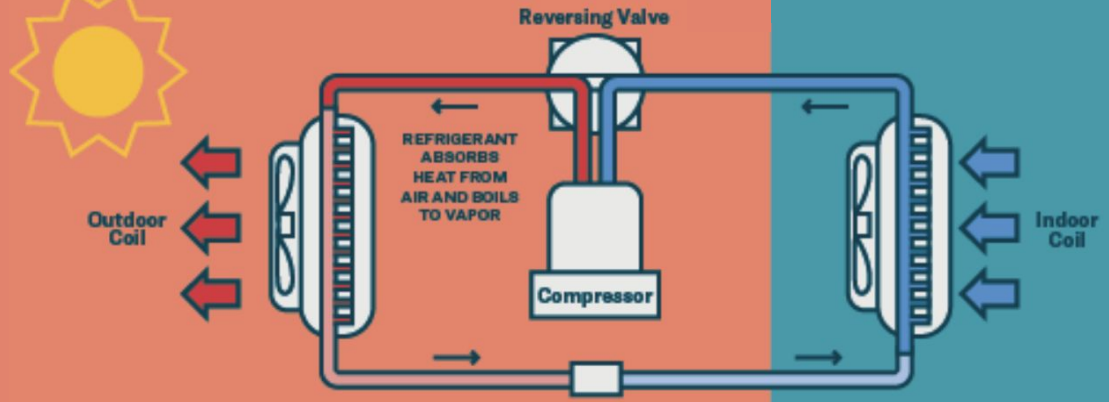
Heat Pump Space Heating



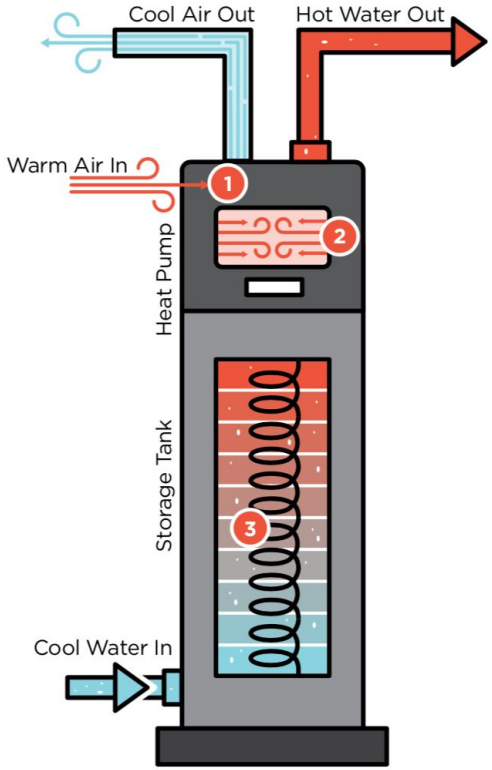


Heat Pumps heat OR cool by moving heat inside or outside based on the temperature you want to achieve on your thermostat.





Heat Pump Water Heaters

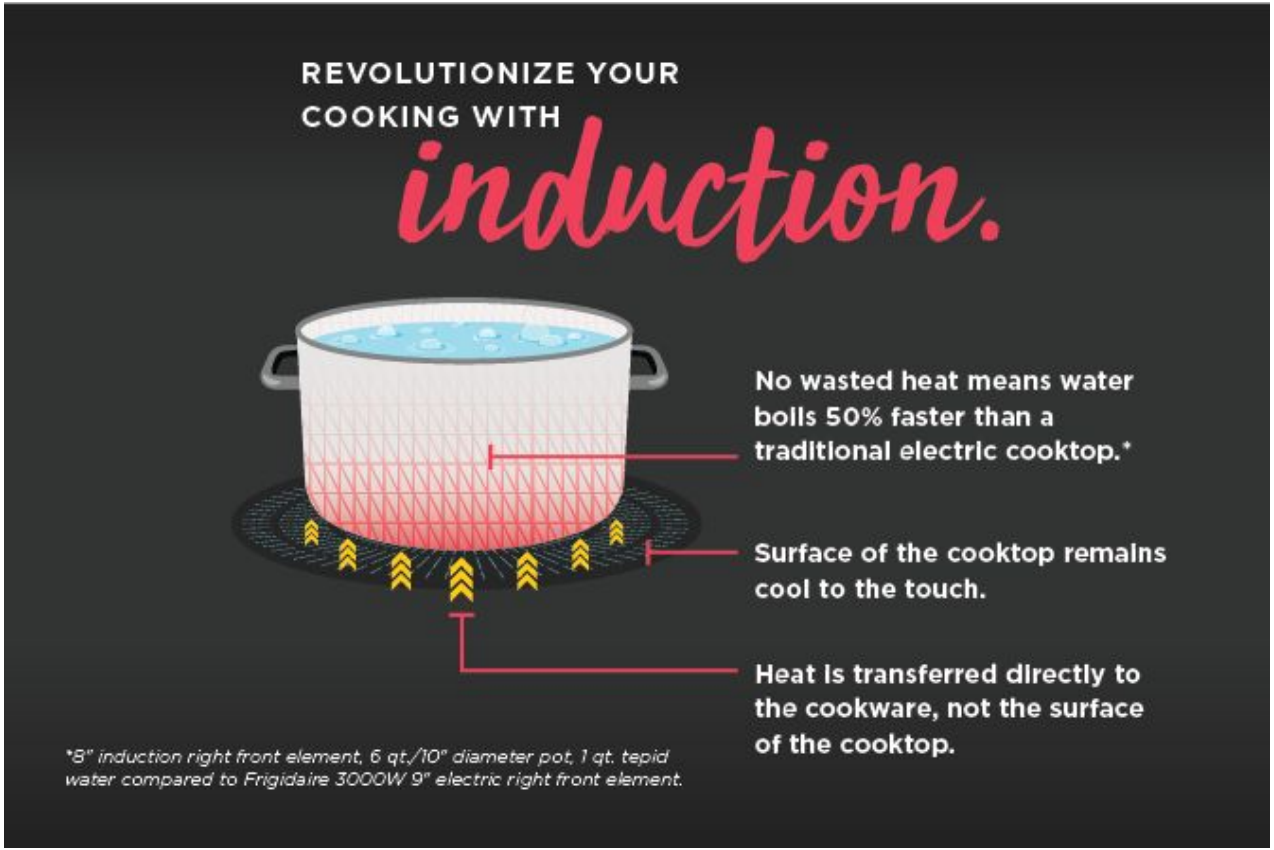


HOW DO HEAT PUMPS WORK?

By transferring heat rather than creating it, heat pumps deliver hot water **3-5 times more efficiently** than conventional water heaters.

1. Heat pump pulls warmth from the air.
2. Warm air is compressed, increasing its temperature.
3. Condenser coils transfer heat to the water.

Induction Stoves



Electric Alternatives