Photo: U.S. Department of Energy

EPA
United States
Environmental Protection
Agency

Reducing Methane from the Oil and Natural Gas Source Category

NOVEMBER 2021

EPA's Proposal for the Oil and Natural Gas Source Category

On November 2, 2021, EPA issued a proposed rule to reduce climate- and health-harming pollution from the oil and natural gas industry

EPA's proposal would:

- Secure major climate and health benefits for all Americans
- Expand and strengthen emissions reduction requirements for new, modified and reconstructed sources in the oil and natural gas industry
- Require states to minimize or eliminate pollution from hundreds of thousands of existing sources nationwide
- Encourage the use of innovative monitoring technologies and other cutting-edge solutions

Overview of Proposal Impacts

EPA's proposal would:

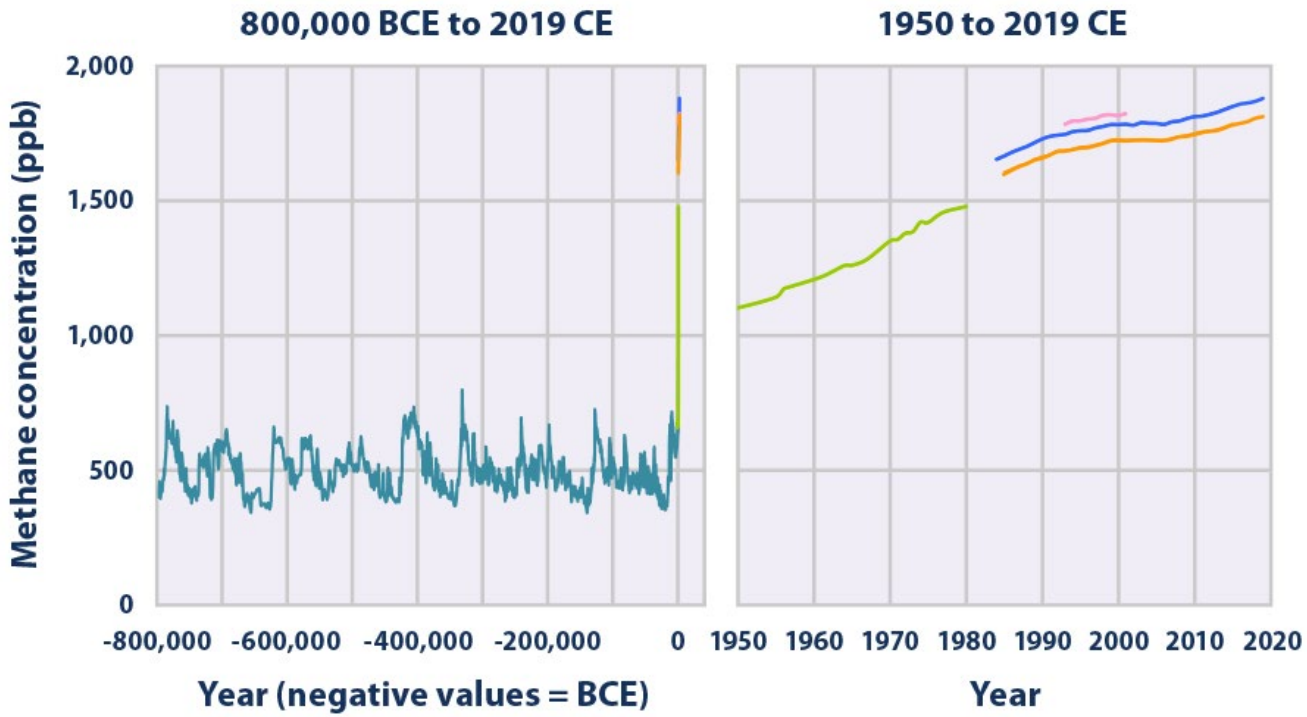
- Yield nearly **$4.5 billion in climate benefits a year**, totaling $48 to $49 billion from 2023 through 2035 – *after* factoring in costs
- **Increase recovery of natural gas** that otherwise would go to waste, valued at $690 million in 2030 alone
- By 2035, reduce approximately:
  - 41 million tons of **methane** emissions (equivalent to 920 million metric tons of CO_2)
  - 12 million tons of **smog-forming VOC** emissions
  - 480,000 tons of **air toxics** emissions

Methane Emissions Accelerate Climate Change

Global atmospheric concentrations of methane are **unprecedented** compared with the past 800,000 years

Methane is a greenhouse gas that traps at least **25 times as much heat** as carbon dioxide

Methane emissions are responsible for about **a third of the warming** due to human emissions of greenhouse gases

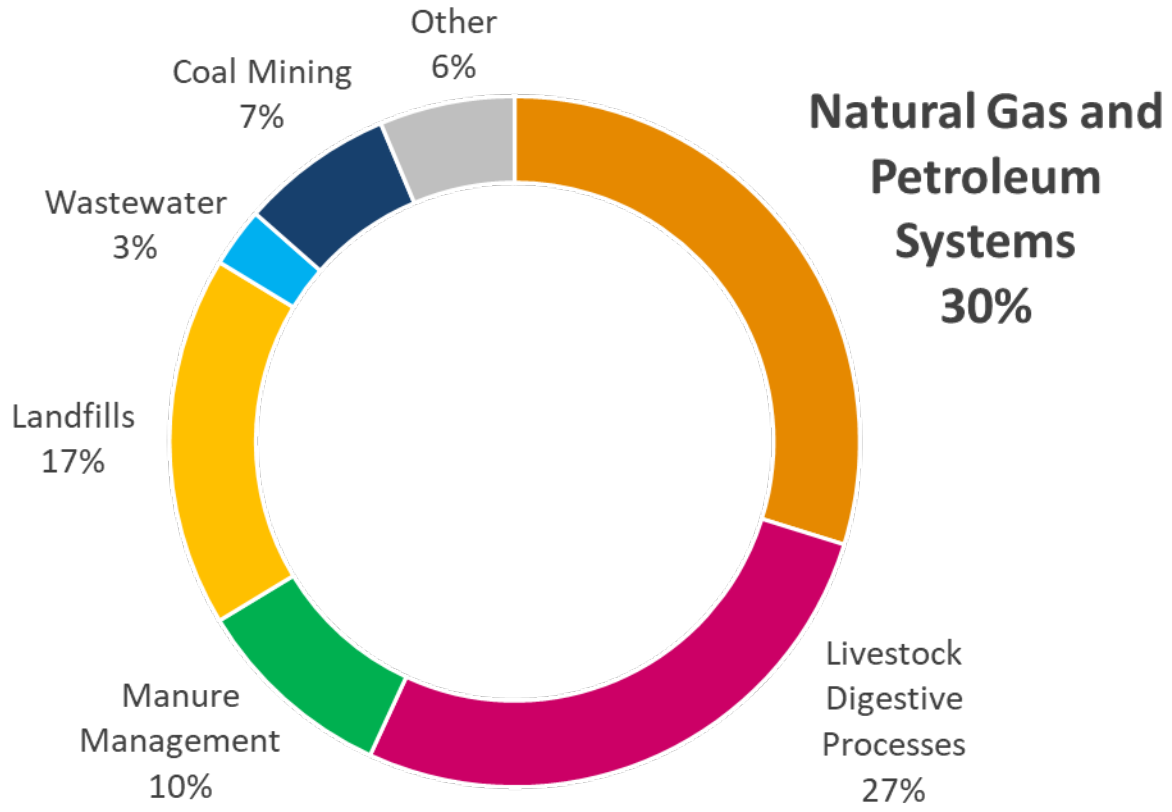


Concentrations of methane in the atmosphere from hundreds of thousands of years ago through 2019, measured in parts per billion (ppb). Each line represents a different data source.

Methane Emissions from the Oil and Gas Sector

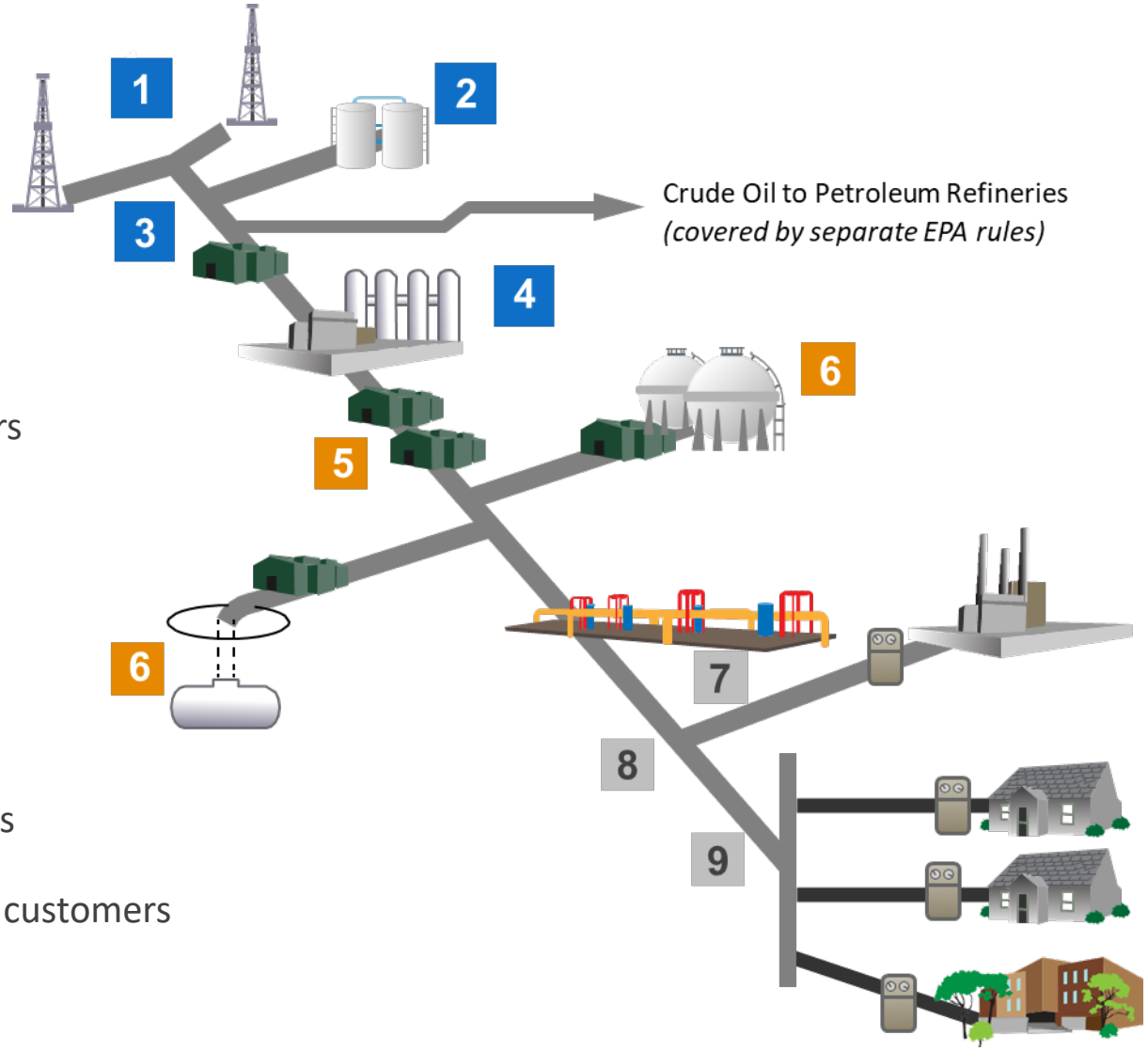
The oil and gas sector is the **largest industrial source of methane emissions** in the United States

The oil and gas sector also emits other harmful pollutants, like smog-forming volatile organic compounds, and toxic chemicals like benzene



Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2019

Crude Oil and Natural Gas Industry: Where EPA's Proposed Methane Rules Would Apply



Production & Processing

EPA's methane proposal covers equipment & processes at:

1. Onshore well sites
2. Storage tank batteries
3. Gathering & boosting compressor stations
4. Natural gas processing plants

Natural Gas Transmission & Storage

EPA's methane proposal covers equipment & processes at:

5. Compressor stations
6. Storage tank batteries

Distribution

(not covered by EPA rules)

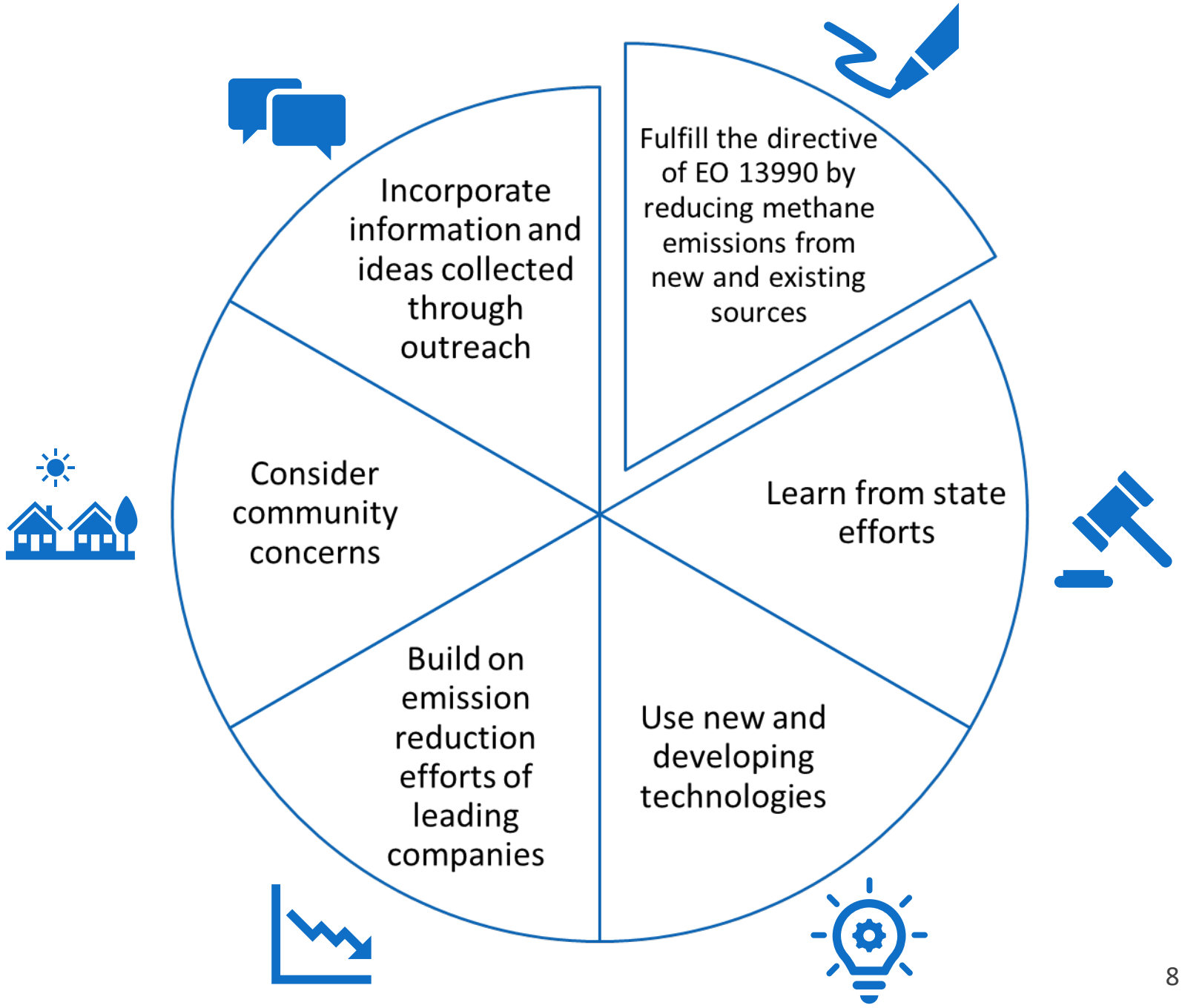
7. Distribution mains/services
8. City gate
9. Regulators and meters for customers

Figure: Adapted from American Gas Association and EPA Natural Gas STAR Program

United States Environmental Protection Agency

Pre-Proposal Outreach

Proposal Development



Clean Air Act Section 111

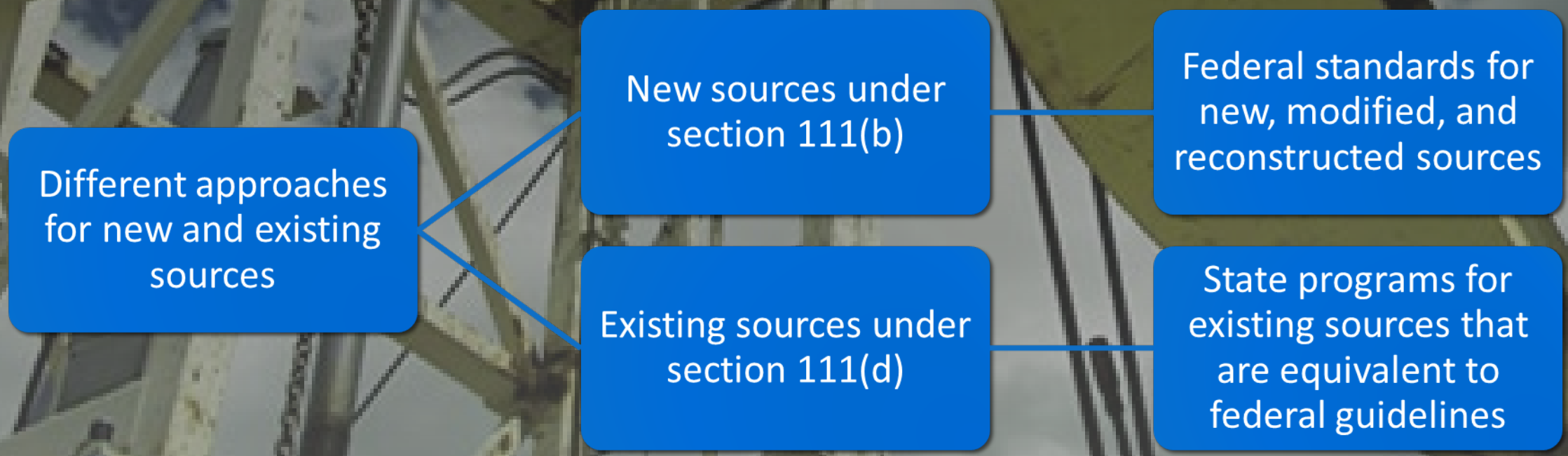
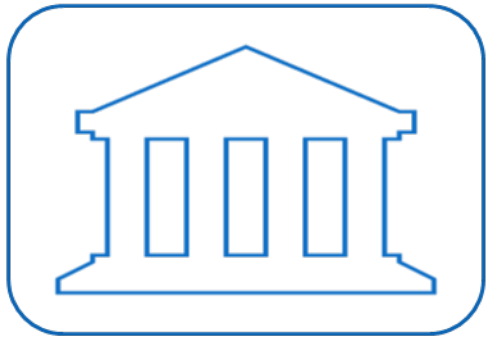


Photo: U.S. Department of Energy

Reducing Emissions at New, Modified, and Reconstructed Sources

EPA's standards for **new sources** reflect the degree of emission limitation achievable through the application of the **best system of emission reduction**

Standards are **reviewed at least every 8 years** and revised, if appropriate



Congress
Clean Air Act Section 111(b)

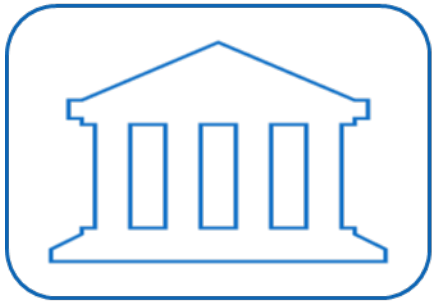
EPA
Sets new source performance standards

States
Issue state permits

Emissions Reductions

Reducing Emissions at Existing Sources

Congress recognized that **existing sources** do not have as much flexibility as new sources to build emission controls into their design



Congress
Clean Air Act
Section 111(d)

EPA
Sets emission guidelines

States
Develop state plans to submit to EPA

EPA
Reviews and approves state plans

If a state does not submit an approvable plan, EPA will issue a Federal Plan

Emissions Reductions

Proposed Emission Guidelines for Existing Sources

- EPA's proposal includes:

Proposed **best system of emission reduction** for existing sources

Presumptive standards based on the best system of emission reduction for existing sources (called "designated facilities")

  - Most presumptive standards mirror the standards EPA is proposing for new sources

- Once Emissions Guidelines are final, states may adopt the presumptive standards as part of their plans, or they may develop their own standards that generally are as strict
  - States have flexibility when applying the standard of performance in their plans, including consideration of factors such as the remaining useful life of the source
- EPA expects to soon propose updates to the general provisions related to state requirements under Clean Air Act section 111
  - Will provide additional direction to states and tribes on related issues, such as the timeframe to submit state plans and consideration of the remaining useful life of a source

Key Components of the Proposal

Finding and Repairing Methane Leaks at New and Existing Well Sites and Compressor Stations

- Focus monitoring efforts on sites and equipment that are **most likely to have large emissions**

Larger well sites (estimated emissions ≥ 3 tons per year): Must monitor for leaks **at least once every three months** and promptly repair any leaks found

Smaller well sites (estimated emissions < 3 tons per year): Must conduct a **one-time survey** to demonstrate no leaks or malfunctions; ongoing monitoring not required

EPA is co-proposing requirement that well sites with estimated emissions between 3 and 8 tons per year be monitored semi-annually, rather than quarterly

All new and existing **compressor stations** would monitor and repair leaks **at least once every three months**

Surveys must include inspections of equipment most **prone to large leaks and malfunctions**, including storage vessels and flares

Sources on the Alaska North Slope would have different monitoring schedules to account for weather

Encouraging Innovation by Incorporating Advanced Measurement Technologies

- **To find major leaks rapidly and at a lower cost**, many stakeholders have expressed strong support for the use of **advanced measurement technologies**
- EPA's proposal includes **an alternative to the proposed fugitive monitoring requirements**, allowing owners and operators to use these advanced technologies to detect leaks at all well sites and compressor stations (including well sites with estimated emissions < 3 tons per year)

Any technology capable of meeting a rigorous minimum detection threshold (10 kg/hr) would be permitted	Leak surveys and follow-up repairs using these advanced technologies would be required at least once every two months	To ensure smaller leaks are detected, surveys must be supplemented by annual monitoring using optical gas imaging or EPA Method 21

- EPA is taking comment on whether this advanced measurement technology pathway is the best system of emission reduction and should be required for all well sites and compressor stations

Transitioning to Zero-Emitting Technologies for Pneumatic Controllers

- EPA proposes to:

Regulate emissions from **intermittent** vent pneumatic controllers for the first time

Require all new and existing pneumatic controllers in production, processing, and transmission and storage facilities to have **zero methane and VOC emissions**, with the exception of sites in Alaska that do not have power

- Natural gas-driven pneumatic controllers are currently used extensively in production, processing, and transmission and storage facilities
  - The vast majority of these emissions come from intermittent vent controllers that are currently unregulated under the Clean Air Act
  - Multiple zero-emitting alternatives to these pneumatic controllers exist, and several major oil and gas-producing states and Canadian provinces now require their use at new and existing facilities

Eliminating Venting of Associated Gas from Oil Wells

- EPA's proposal would:

Eliminate venting of associated gas from oil wells and requires at least a 95 percent reduction in methane and VOC emissions from associated gas that cannot be captured and sold

Ensure that flares are operating properly through recordkeeping and reporting requirements

- Oil wells frequently produce large amounts of associated natural gas
  - In many areas, there is no sales line for this associated gas, so producers vent or flare the gas
  - This venting, currently unregulated under the Clean Air Act, releases large amounts of methane into the air (nearly 40,000 tons in 2019 alone)

Strengthening Requirements for Storage Tanks

- EPA's proposal would add storage tank batteries (groups of tanks that are adjacent and receive fluids from the same source) to the definition of a storage tank covered by the rule

For **new, modified, and reconstructed storage tanks or tank batteries** with a potential to emit **6 or more tons of VOC per year**, owners/operators would have to reduce VOC and methane emissions by 95 percent

Under the proposed presumptive standard, **existing storage tanks or tank batteries** with a potential to emit of **20 tons of methane per year or greater**, owners/operators would have to control their emissions by 95 percent

Broadening the Type of Pneumatic Pumps Covered by the Rule

- The proposal **extends current requirements for new pneumatic pumps** to include all natural gas-driven diaphragm and piston pumps in the production segment of the industry, and diaphragm pumps in the transmission segment

Standards require pneumatic pumps with access to an onsite control device to **reduce emissions by 95 percent**

For existing sources, the presumptive methane standards for pneumatic pumps would mirror those proposed for the NSPS but exclude piston pumps

- EPA is seeking comment on **whether it is feasible to further strengthen** the proposed standard, including by requiring the use of zero-emitting pneumatic pumps at new and existing facilities with access to electric power

Reducing Additional Methane and VOC Emissions Through New and Stronger Requirements

- EPA's proposal would:

Equipment Leaks at Natural Gas Processing Facilities

- Require leak detection and repair with bimonthly optical gas imaging following the procedures in Appendix K
- Adopt those requirements as presumptive standards for existing sources

Reciprocating Compressors

- For the NSPS:
- Require reciprocating compressor rod packing to be replaced based on the results of annual monitoring; or
- Require emissions from the rod packing to be collected and routed to a process through a closed vent system under negative pressure
- Adopt those requirements as presumptive standards for existing sources

Centrifugal Compressors

- Require emissions from the wet seal degassing system to be captured and routed to a control device that reduces emission by 95 percent
- Adopt those requirements as presumptive standards for existing sources

Reducing Additional Methane and VOC Emissions Through New and Stronger Requirements, cont.

- EPA's proposal would:

Well Completions

- For non-wildcat and non-delineation wells:
  - Require reduced emission completion in combination with a completion combustion device
  - Require venting in lieu of combustion where combustion would present safety hazards
- For exploratory and delineation wells and low-pressure wells:
- Require all flowback to be routed to a completion combustion device with a continuous pilot flame; or
- Require all flowback to be routed into one or more well completion vessels and begin operation of a separator unless it is technically infeasible

Sweetening Units

- Require achievement of minimum SO2 emission reduction efficiency

Liquids Unloading

- Require liquids unloading to be performed with zero methane or VOC emissions
  - If not feasible for safety or technical reasons, employ best management practices to minimize venting
  - EPA is also co-proposing two additional regulatory options for liquids unloading

Considering Environmental Justice Concerns

EPA is proposing to **expand leak detection programs** for new sources to include known sources of large emission events and proposing to require **more frequent monitoring** at sites with more emissions

Proposing an additional requirement in the Emissions Guidelines to **require states to engage with the public in a meaningful way**, including with overburdened and underserved communities, during the development of state plans

Taking comment on **innovative mechanisms** to ensure compliance and minimize emissions

- Soliciting comment on a structure for communities to identify large emission events which owners or operators would then be required to investigate
- Potential mechanisms for the collection and public dissemination of this information

Responding to Small Business Advocacy Review Panel Recommendations

- EPA's proposal responds to several Small Business Advocacy Review Panel recommendations:
  - Focuses fugitive emissions monitoring requirements on larger emitters and imposes fewer requirements on sources that have lower emissions
  - Maintains the wellhead only exemption from fugitive emissions requirements
  - Allows EPA Method 21 as an alternative option for fugitive emissions monitoring and allows alternative screening technologies as compliance alternatives
  - Maintains the streamlined recordkeeping and reporting requirements from the 2020 Technical Rule
  - Maintains the flexibility for in-house engineers to complete certifications of technical infeasibility

Seeking Additional Information

- EPA intends to issue a supplemental proposal in 2022 that will provide proposed regulatory text, and may expand on or modify this proposal in response to public input
- EPA is seeking information about other pollution sources from the oil and natural gas sector that may help us further reduce methane and VOC emissions, including:

Abandoned and unplugged wells

- Oil or natural gas wells that have been taken out of production
- Includes wells sometimes classified as idle, inactive, dormant, or shut-in, but not plugged

Improving flare performance and minimizing malfunctions

- EPA is soliciting comment on the level of emissions reduction that can be reliably achieved using a flare and what measures need to be in place to assure such reduction

Pipeline pigging operations

- A "pig" (barrel-shaped object) is inserted into a pipeline to sweep out accumulated condensed liquids
- Pipeline gas must be removed before a pig can be inserted or removed, potentially resulting in emissions

Tank truck loading operations

- Result in emissions when organic vapors in empty tank trucks are displaced to the atmosphere as crude oil, condensate, intermediate hydrocarbon liquids, or produced water from storage vessels is loaded into the tank trucks

Seeking Additional Information, cont.

- EPA also is seeking comment on:

Proposed approach for **fugitive emissions monitoring** at well sites

- Baseline emission threshold and other criteria to determine ongoing monitoring requirements
- Methodology for calculating baseline methane emissions
- Ensuring emissions from wells owned by small businesses are addressed while recognizing the challenges specific to small businesses

Ensuring captured associated gas is collected for a **useful purpose** rather than flared

Feasibility of requiring broader use of **zero-emitting technology for pneumatic pumps**

Alternative measurement technologies

- Evaluate whether a change in the best system of emission reduction from the proposed quarterly optical gas imaging monitoring to a monitoring program using alternative measurement technologies is appropriate

Seeking Additional Information Related to Small Businesses

- EPA is seeking comment on several aspects of the proposal that would affect small businesses:

Whether it is appropriate for existing well sites, or a subcategory of sites, to have different emission profiles due to site characteristics or other factors

Regulatory alternatives for low-production well sites that accomplish Clean Air Act objectives and minimize significant economic impact to small businesses

Emissions from low-production well sites, along with information on any factors that may make certain well sites less likely to emit methane and VOCs

Information that would assist EPA in evaluating the cost burden on the smallest companies or individual well site owners

- The Agency is continuing to examine the impact that fugitive emissions monitoring requirements have on small businesses, particularly on businesses with very few employees and very few well sites

Highlights from Regulatory Impact Analysis

Analysis for 2023 – 2035

Total Emission Reductions

- 41 million short tons of methane
  (equivalent to 920 million metric tons of carbon dioxide)
- 12 million short tons of VOC
- 480,000 short tons of air toxics

Total Net Benefits (2019$)

- $48 to $49 billion in net benefits
  (3 percent and 7 percent discount rates, respectively)
  - Equivalent to more than $4 billion a year

Total Benefits (2019$)

- $55 billion in climate benefits
  - $5.2 billion in benefits a year

Total Costs

- $6.3 billion to $13 billion in costs
  - $680 million to $1.2 billion in costs a year

Rulemaking Process

Proposal
- November 2021

Comment Period
- Ends January 31, 2022

Supplemental Proposal
(and comment period)
- 2022

Final Rule
- 2022