DELIVERING ON THE U.S. METHANE EMISSIONS REDUCTION ACTION PLAN

NOVEMBER 2022

THE WHITE HOUSE
WASHINGTON

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The U.S. Methane Action Plan: Delivering Progress & Raising Ambition

Following the November 2021 release of the U.S. Methane Emissions Reduction Action Plan, the Biden-Harris Administration has made historic progress on tackling U.S. methane emissions, cutting consumer costs, protecting workers and communities, maintaining and creating high-quality, union-friendly jobs, and promoting U.S. innovation and manufacturing of critical new technologies—through executive action and historic new investments in the Bipartisan Infrastructure Law and Inflation Reduction Act. These activities reinforce U.S. international leadership on methane action as a co-founder of the Global Methane Pledge, which aims to reduce anthropogenic methane emissions by at least 30% by 2030 from 2020 levels. Over 130 countries have now joined the Pledge. Rapidly reducing methane emissions in line with the Global Methane Pledge target is essential to limit warming to 1.5°C.

At the 2022 United Nation Climate Change Conference (COP27), President Biden is announcing that his Administration is **deploying $20 billion in new investments** targeted at reducing methane emissions.

Along with these game-changing investments, ambitious new actions will drive faster reductions in a key sector: the Environmental Protection Agency (EPA) is advancing a supplemental proposal that expands on its previous proposed standards to reduce methane from oil and natural gas facilities, as well as other harmful pollution that can affect health and air quality in nearby communities. These standards will prevent wasteful leaks; studies have estimated that the overall methane leak rate from oil and gas operations could be 2.3% or higher—losses that would be enough to fuel 10 million homes a year.

As a greenhouse gas, methane is considered a "super-pollutant" because it is more than 80 times more potent in trapping heat than carbon dioxide over the first 20 years after it reaches the atmosphere. With the new steps outlined in this Action Plan Update, the Administration is now **taking more than 50 actions** targeted at reducing methane emissions across the major emitting sources: oil and gas systems, abandoned coal mines, landfills, and agriculture. The Administration's wide-ranging efforts to advance energy efficiency and electrification across the building and industrial sectors will contribute to methane pollution reduction as well. States are also swiftly reducing methane emissions with bold, innovative policies and action, as documented by the U.S. Climate Alliance.

The Methane Emissions Reduction Action Plan enables the United States to leverage all available tools to reduce methane emissions while protecting public health, promoting U.S. innovation in new technologies, lowering energy costs for families by reducing inefficiency and waste, and supporting good-paying jobs for thousands of skilled workers across the country.

This Action Plan Update outlines key new steps the Biden-Harris Administration is taking across sectors to build on the November 2021 Action Plan.

Oil & Gas

The oil and gas sector is the largest industrial source of methane emissions in the United States, responsible for approximately one-third of total U.S. methane emissions. Last year, EPA proposed new standards and guidelines requiring oil and natural gas facilities to cut harmful pollution and energy waste from hundreds of thousands of oil and gas sources—including for the first time from existing sources—with a particular focus on equipment that can leak or release methane. In June 2022, President Biden launched the Global Methane Pledge Energy Pathway, calling upon the world to rapidly reduce methane emissions in the oil and gas sector to achieve the Global Methane Pledge target.

The Biden-Harris Administration is building on this effort by:

- **Further Accelerating Methane Reduction Through Critical, Commonsense Standards.** Today, EPA is announcing a supplemental proposal on methane that will reduce harmful emissions and energy waste from covered sources by 87% below 2005 levels in 2030. It will also make sharp cuts in emissions of other dangerous pollutants that threaten Americans' health and welfare. The supplemental expands the use of new technologies and monitoring approaches, including the addition of a ground-breaking "Super-Emitter Response Program" that would require operators to respond to credible third-party reports of high-volume methane leaks. It also strengthens and expands the standards EPA proposed in November 2021, including revised monitoring requirements for fugitive emissions and operational and performance requirements for flares and other control devices.

- **Strengthening Incentives for Rapid Methane Mitigation and Innovation**. Working hand-in-hand with its proposed standards, EPA is providing $1.55 billion in financial and technical assistance under the Inflation Reduction Act to monitor and reduce methane emissions from oil and gas operations, including $700 million to support pollution reduction activities at marginal conventional wells. EPA is also implementing a methane "waste emissions charge" per ton of methane emitted for applicable oil and gas facilities that exceed statutorily specified waste emissions thresholds. EPA has published a request for information seeking public comment on core design aspects and has announced initial public engagement opportunities that will help ensure that implementation reflects broad input from stakeholders. Additionally, the Department of Energy (DOE) is helping companies and universities develop technologies to reduce methane emissions from the oil, gas, and coal industries through the Advanced Research Projects Agency–Energy (ARPA-E), including, for example, the Reducing Emissions of Methane Every Day of the Year (REMEDY) program.

- **Improving Monitoring and Measurement.** Through the White House-led Greenhouse Gas Monitoring & Measurement Interagency Working Group, federal agencies are collaborating to better detect, quantify, and address methane emissions, including by:
    - Funding new research & development. DOE's Office of Fossil Energy and Carbon Management (FECM) recently announced up to $32 million in funding toward the research and development of new monitoring, measurement, and mitigation technologies to help detect, quantify, and reduce methane emissions across oil and natural gas producing regions of the United States. ARPA-E is currently supporting two technologies in methane detection as part of its SCALEUP program.
    - Supporting methane emissions monitoring. The Inflation Reduction Act provides $20 million for EPA to advance methane emissions monitoring, including through grant awards.
    - Bolstering current and upcoming observing systems. Agencies are leveraging current and upcoming observing systems to enhance GHG emissions information and analyses, including for methane. For example, NASA's new EMIT mission has demonstrated the capability to detect methane, including identifying "super-emitters."

- **Plugging Methane Leaks from Orphaned Oil and Gas Wells.** Many of the approximately 2 million unplugged non-producing oil and gas wells scattered across the United States, including over a hundred thousand orphaned wells, continue to release methane into the atmosphere. The EPA estimates that unplugged, non-producing wells (including orphaned wells) emitted 275,000 metric tons of methane in 2020. The Department of Interior is moving quickly to deploy nearly $5 billion under the Bipartisan Infrastructure Law to plug tens of thousands of orphaned oil and gas wells throughout the United States, fighting climate change and creating good-paying jobs. For example:
    - The Administration announced a $33 million investment to address 277 high-priority polluting wells on federal land that pose threats to human health and safety, the climate, and wildlife. Agencies receiving funding will measure methane emissions before and after plugging using a methane measurement protocol developed by a multi-agency Technical Working Group.
    - The Department of the Interior has also distributed the first $560 million from the roughly $4.2 billion Orphaned Wells Grant Program to U.S. states to allow those states to plug roughly 10,000 high-priority orphaned wells.

- **Reducing Gas Waste, Preventing Gas Leaks, and Boosting Pipeline Safety.** The Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA) is implementing a comprehensive approach to eliminate methane emissions from gas pipeline systems, including production-related gathering lines, trunk line transmission pipelines, and local distribution pipelines.
    - In 2022, PHMSA made significant progress in rulemaking to boost safety, reduce climate impact, protect workers, and improve efficiency in America's energy

system. This includes implementing a requirement that pipeline operators update their inspection and maintenance plans to address the elimination of hazardous methane leaks from pipeline facilities; an Automatic Shut-Off Valve rule to improve safety and mitigate methane emissions; and a Gas Transmission Pipelines Safety Rule that strengthens safety requirements for gas transmission pipelines.
    - PHMSA is also implementing its new Natural Gas Distribution Infrastructure Safety and Modernization grant program, which will make $1 billion available to reduce risks from municipality or community-owned legacy gas distribution pipelines that are prone to methane leaks.
    - The Bureau of Land Management is also working toward modernizing its regulations to reduce natural gas waste and pollution through unnecessary flaring, venting, and leaks from oil and gas production on leases on Federal and Indian lands.

Landfills & Food Waste

Municipal solid waste (MSW) landfills are the third largest industrial source of anthropogenic methane in the United States. Additionally, food accounts for 24% of material in our MSW landfills and is a major contributor to these emissions. Understanding, monitoring, and managing waste sector methane emissions continues to be a priority for the Administration.

- **Conducting Outreach and Developing New Resources.** EPA continues to boost its voluntary landfill methane outreach program to achieve a national goal of 70% methane emissions capture for all landfills around the country. EPA also recently published a Toolkit for Expiring Landfill Gas Electricity Power Purchase Agreements, which helps project owners understand options to keep their energy projects operating. EPA will continue to update the Landfill Methane Outreach Program (LMOP) National Map to include EJSCREEN data, so project developers consider impacts to neighboring communities in their project planning.

- **Launching New and Expanded Efforts to Cut Food Waste.** The U.S. Department of Agriculture (USDA), EPA, and Federal Drug Administration (FDA) are part of a Federal Interagency Food Loss and Waste Collaboration that is working toward the national goal of reducing food loss and waste by 50% by 2030. USDA is investing up to $90 million in food loss and waste reduction, including $30 million in additional funding for the Composting and Food Waste Reduction Program. The Bipartisan Infrastructure Law provides EPA with $350 million for 2 grant programs to improve solid waste management infrastructure and recycling, including for food and other organic waste. EPA, USDA, and FDA are also coordinating to develop a National Food Loss and Waste and Organics Strategy.

Abandoned Mines

Abandoned coal mines are estimated to emit 237,000 metric tons of methane annually. The Bipartisan Infrastructure Law appropriated more than $11 billion to eligible states and Tribes to reclaim abandoned coal mines over 15 years to help eliminate methane pollution. In August, DOI announced nearly $725 million available to 22 states and the Navajo Nation, bringing the total funding available to coal communities in 2022 to nearly $1 billion. This will help create good-paying union jobs, spur economic revitalization, create opportunities for current and former coal workers, and restore lands and waters impacted by legacy coal mining.

Agriculture

USDA is deploying multiple strategies to reduce U.S. agricultural sector methane emissions. New and ongoing initiatives include:

- **Expanding Markets for Climate-Smart Commodities.** In September, USDA announced $2.8 billion of investments in 70 projects under the first pool of the Partnerships for Climate-Smart Commodities program. Of these investments, over $500 million will support projects that focus on methane reductions. Overall, the Partnerships for Climate-Smart Commodities projects will result in hundreds of expanded markets and revenue streams for producers of climate-smart commodities. These 70 projects are anticipated to reach more than 50,000 farms encompassing about 25 million acres of working land and sequester or reduce 50 million metric tons of carbon dioxide equivalent over their lifetimes.

- **Investing in Climate-Smart Conservation Assistance and Improving Agricultural GHG Emissions Monitoring Capabilities.** The Inflation Reduction Act provided more than $19 billion in critical investments in the Natural Resources Conservation Service's oversubscribed conservation programs, targeting funding to climate-smart financial and technical assistance for farmers. The Inflation Reduction Act also unlocked $300 million in new funding to USDA to implement a program to quantify and track the resulting carbon sequestration and reduction in carbon dioxide, methane, and nitrous oxide emissions of these investments.

- **Creating Industry Partnerships.** In June, USDA signed an MOU with the Innovation Center for U.S. Dairy to encourage adoption of technologies and practices that improve sustainability and assist in addressing U.S. dairy farmers' environmental needs. This renewed collaboration will accelerate and streamline delivery of programs focused on resource recovery, sustainability improvement, soil health management, and greenhouse gas emissions reduction, particularly methane.

- **Financing Manure Management Technologies.** USDA's Rural Development Agency continues to finance the application of manure management technologies that are reducing methane emissions in the agricultural sector, such as installation of anaerobic

digesters on livestock farms. USDA has recently supported dozens of anaerobic digester projects, including community-scale digesters, through grants and guaranteed loans. Last year, the Rural Development Agency also supported a broader range of methane-reducing investments through over $64 million in additional grants and guaranteed loans.

- **Supporting Foundational Research.** USDA's National Institute of Food and Agriculture and Agricultural Research Services will continue to invest in manure management and methane-related research, education, and extension projects, including competitively funded grants. Over the past 5 years, the Institutes have invested nearly $90 million in these efforts.

Building & Industrial Sectors

In addition to taking more than 50 actions to tackle major emitting sources of methane—oil and gas systems, coal mines, landfills, and agriculture—the Biden-Harris Administration is also advancing wide-ranging efforts to boost efficiency in the building and industrial sectors.

Reducing Harmful Emissions and Energy Waste from Buildings through Efficiency and Electrification

Residential and commercial buildings represent over 25% of U.S. natural gas consumption. Gas appliances also pose health risks, including by emitting methane and nitrogen oxides (NOx). The Biden-Harris Administration has taken new steps to advance energy efficiency improvements and building electrification—key strategies to boost efficiency and cut methane emissions, improve indoor air quality, and save families money on energy bills. Recent actions include:

- **Investing in Home Efficiency and Electrification Upgrades**. The Inflation Reduction Act directs unprecedented levels of funding toward the critical aim of making the building sector climate-friendly, more affordable, healthier, and safer. The Administration recently announced nearly $9 billion in state and Tribal allocations for giving households direct rebates to make energy efficiency upgrades and install electric appliances, which will help reduce methane and other sources of emissions related to combustion equipment in our homes. The Administration has also expanded the Weatherization Assistance Program for low-income households, using Bipartisan Infrastructure Law funds to support more "whole home" retrofits that will reduce emissions while providing savings and health improvements.

- **Improving Appliance Efficiency Standards.** DOE proposed new energy efficiency standards for residential gas furnaces. Over 30 years, the proposed rule would reduce methane emissions by 5.1 million tons, while also saving households a cumulative $30 billion on utility bills. Also in 2022, DOE proposed new efficiency standards for commercial water heaters, consumer pool heaters, and residential clothes dryers—including gas-fired models—that together are expected to reduce methane emissions over

30 years by roughly another 1.5 million tons.

- **Accelerating Heat Pump Deployment.** President Biden took historic action by authorizing the Defense Production Act to rapidly expand U.S. manufacturing of five critical clean energy technologies, including electric heat pumps that provide super-efficient home heating and cooling. $250 million in the Defense Production Act funding from the Inflation Reduction Act will support domestic heat pump manufacturing. As part of the Initiative for Better Energy, Emissions, and Equity, focused on RD&D of clean heating and cooling systems, DOE recently announced that three companies have now met its Residential Cold Climate Heat Pump Challenge requirements for higher performance in cold weather.

- **Leading by Example in Federal Buildings.** As part of work to implement President Biden's Executive Order on Federal Sustainability, federal agencies will design all large new construction and modernization projects (above 25,000 gross square feet), starting now in Fiscal Year 2022, to be net-zero emissions—which includes the use of all-electric equipment and appliances and efficiency measures significantly above current model codes.

Advancing Clean Manufacturing

The industrial sector represents about 33% of U.S. natural gas consumption, with many factories using natural gas as a fuel for process heating, or as a raw material to produce chemicals and other products. The Biden-Harris Administration is taking a wide range of actions to reduce emissions and advance clean technologies across industrial facilities, while supporting good-paying jobs as America leads the way on advanced manufacturing. Recent efforts include:

- **Investing in Next-Generation Clean Industry.** Both the Bipartisan Infrastructure Law and the Inflation Reduction Act provide historic support for transforming industrial processes that currently rely on fossil fuels. For example, the Administration recently opened funding applications for the Bipartisan Infrastructure Law's $7 billion program to create regional clean hydrogen hubs, which can support hydrogen use across heavy industry. The Inflation Reduction Act creates a new $5.8 billion Advanced Industrial Facilities Deployment Program that can help manufacturers of products like iron, steel, and cement adopt electrification, clean fuels, and other advanced-manufacturing processes.

- **Accelerating Innovation on Key Technologies.** The dominant source of heat for the manufacturing sector today is combustion of natural gas. To advance breakthroughs on clean alternatives, DOE recently launched the Industrial Heat Shot™ to develop cost-competitive industrial heat technologies with at least 85% lower greenhouse gas emissions by 2035. DOE is also creating a new Clean Energy Manufacturing Innovation Institute, bringing together industry, academia, and government partners to develop and

scale technologies to electrify industrial process heating and reduce emissions across the sector.

- **Partnering with Manufacturers on Energy Savings.** Across the industrial sector, 60 companies have joined the Administration's new Better Climate Challenge, partnering with DOE to reduce their portfolio-wide greenhouse gas emissions at least 50% by 2030. DOE's Better Plants program, which accelerates adoption of more energy efficient practices and innovative technologies, expanded in 2022 to cover 14% of the U.S. manufacturing footprint. Additionally, the Bipartisan Infrastructure Law provides $550 million for DOE to expand the Industrial Assessment Centers program, which trains engineering students and provides no-cost technical assessments to help small- and medium-sized manufacturers save energy, improve productivity, and reduce waste.

- **Leveraging the Power of Federal Procurement.** Under the Federal Buy Clean Initiative, federal agencies are prioritizing purchase of steel, concrete, asphalt, and flat glass products that have lower embodied emissions across their lifecycle—including the manufacturing process. The Administration recently announced new federal actions to support this initiative, along with Buy Clean efforts from state and local governments and the private sector.

THE WHITE HOUSE OFFICE OF DOMESTIC CLIMATE POLICY

U.S. METHANE EMISSIONS REDUCTION ACTION PLAN

CRITICAL AND COMMONSENSE STEPS TO CUT POLLUTION AND CONSUMER COSTS, WHILE BOOSTING GOOD-PAYING JOBS AND AMERICAN COMPETITIVENESS

NOVEMBER 2021

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WASHINGTON

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I. EXECUTIVE SUMMARY

The United States has a robust record of advancing commonsense technologies and techniques to reduce methane emissions as part of the fight against climate change. However, in this decisive decade, those efforts must be redoubled—and ambition must be raised. This new set of actions rest on a deep technical and scientific understanding of methane emissions, their sources, and mitigation opportunities. And they leverage growing momentum. In recent years, federal, state, and local agencies as well as private sector leaders have initiated a number of commonsense regulatory and voluntary efforts to reduce methane emissions, while supporting innovation in next-generation technologies to detect and reduce methane emissions across the economy.

The Biden-Harris Administration, through the National Climate Task Force, has launched an ambitious, whole-of-government initiative to significantly redouble efforts and reduce emissions. Through these domestic actions, the United States is catalyzing similar actions around the world, working in partnership with the European Union to lead a Global Methane Pledge—with signatories representing more than 60% of global GDP and many of the largest emitters—to reduce overall methane emissions by 30% below 2020 levels by 2030.

This *U.S. Methane Emissions Reduction Action Plan* focuses on cutting pollution here at home from the largest sources of methane emissions in the United States. It uses all available tools—commonsense regulations, catalytic financial incentives, transparency and disclosure of actionable data, and public and private partnerships—to identify and reduce methane emissions. These cost-effective actions will dramatically reduce greenhouse gas emissions, cut leaks, waste, and consumer costs, protect workers and communities, maintain and create high-quality, union-friendly jobs, and promote U.S. innovation and manufacturing of critical new technologies.

The *Action Plan* includes a number of critical and commonsense steps to tackle methane emissions from the oil and gas sector, which currently represents the largest source of industrial emissions of methane:

- The Environmental Protection Agency (EPA) is proposing updated rules of the road for methane from new oil and gas sources and its first set of limits on existing oil and gas sources. The proposal would reduce emissions from covered sources, equipment, and operations by about 75%.
- The Department of the Interior is focusing on opportunities to tackle the venting and flaring of methane from oil and gas operations and well closures on public lands and waters.
- The Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA) is implementing the bipartisan PIPES Act by upgrading and expanding pipeline rules that will, among other things, require operators to cut methane leaks and excursions.

The *Action Plan* also takes aim at methane emissions from landfills—the second largest industrial source of methane:

- Building on efforts earlier this year to put in place an enforceable federal backstop plan to ensure emissions reductions from large municipal landfills, EPA is ramping up an initiative to reduce the food loss and waste that serves as a major contributor to landfill methane emissions.
- EPA is also boosting its voluntary landfill methane outreach program to achieve a national goal of 70% methane emissions capture for all landfills around the country.

In the agriculture sector, the *Action Plan* leverages and expands important and impactful incentive-based and voluntary partnership programs:

- The Department of Agriculture (USDA) has initiated an incentive-based "climate-smart" agriculture program that the President called for in an Executive Order. The program will reward farmers and ranchers for reducing methane emissions (and sequestering carbon) across multiple USDA funding programs.
- USDA is launching a Climate-Smart Partnership Initiative that is exploring the establishment of new markets for agricultural commodities based on the application of climate friendly processes throughout the commodities' supply chains.
- USDA is establishing an Interagency Biogas Opportunities Task Force to facilitate the collection and use of methane for on-farm renewable energy applications.
- The Administration is bolstering the USDA's climate-smart agriculture programs with a greenhouse gas measurement initiative that will identify, confirm, and track methane and other greenhouse gas emissions and carbon sequestration, with a special focus on those associated with climate-smart agricultural practices.

The *Action Plan* includes efforts at a number of other agencies all with the same set of objectives – cutting pollution and consumer costs, while boosting good-paying jobs and American competitiveness. For example:

- The Department of Energy (DOE) is advancing methane emissions reductions in heavy industry through its Industrial Assessment Centers and the Hydrogen Shot initiative, which focuses on the accelerated deployment of affordable low-carbon hydrogen.
- DOE also recently launched an Initiative for Better Energy, Emissions, and Equity—a national research initiative focused on deploying clean and efficient building heating and cooling systems.
- The Department of Housing and Urban Development (HUD) will undertake an equitable green building and electrification initiative for HUD-supported buildings, aimed in part at reducing methane emissions.

President Biden's Build Back Better agenda would accelerate many of these methane emissions reduction efforts. The investment agenda would enable the Department of the Interior to launch an aggressive program to plug hundreds of thousands of orphan oil and gas wells, including many that are still venting methane, employing union workers across the country. Build Back Better would scale up the current Abandoned Mine Land program, funding historic remediation efforts that would result in dramatic methane emissions reductions from thousands of currently leaking, abandoned coal mines. This scaled up program would also enlist tens of thousands of skilled workers, especially in energy communities across the country. Finally, the investment agenda would turbocharge existing USDA efforts, providing farmers and ranchers with more resources to tap the emissions reductions opportunities on the lands and facilities that they manage.

Accelerating the pace with which we cut methane emissions in the United States will advance multiple aims.

First, reducing methane will generate substantial climate benefits. Although methane only represents 10% of U.S. greenhouse emissions, achieving significant reductions will generate rapid and significant beneficial effects because methane is a more powerful greenhouse gas— and more short-lived— than carbon dioxide.[1]

Second, the critical and commonsense steps laid out in the *Action Plan* will create thousands of high-quality, union-friendly jobs and spur innovative solutions in industry and agriculture that will boost U.S. competitiveness around the world.

Third, this initiative will provide improved public health and local air quality for the many disadvantaged communities that have been living with the harmful effects of methane and its frequent companions such as toxic volatile organic compounds (VOCs) and particulates.

Finally, the *Action Plan* reinforces U.S. international leadership to address methane emissions on the global scale. As President Biden announced at the Major Economies Forum, the United States and the European Union are committed to working with global partners to achieve aggressive global action on methane, including through the ambitious Global Methane Pledge. The actions outlined in this plan will both inform and support this global effort in a variety of ways. The emphasis on improving U.S. methane (and other greenhouse gases) measurement and monitoring efforts, for example, will facilitate more accurate global tracking of methane emissions around the world. Likewise, by aggressively pursuing different mitigation approaches across multiple sectors, the United States will gain valuable experience and expertise that can assist other countries in building and increasing their capacity to reduce methane through initiatives like the Global Methane Initiative and the Climate and Clean Air Coalition.

II. WHY METHANE

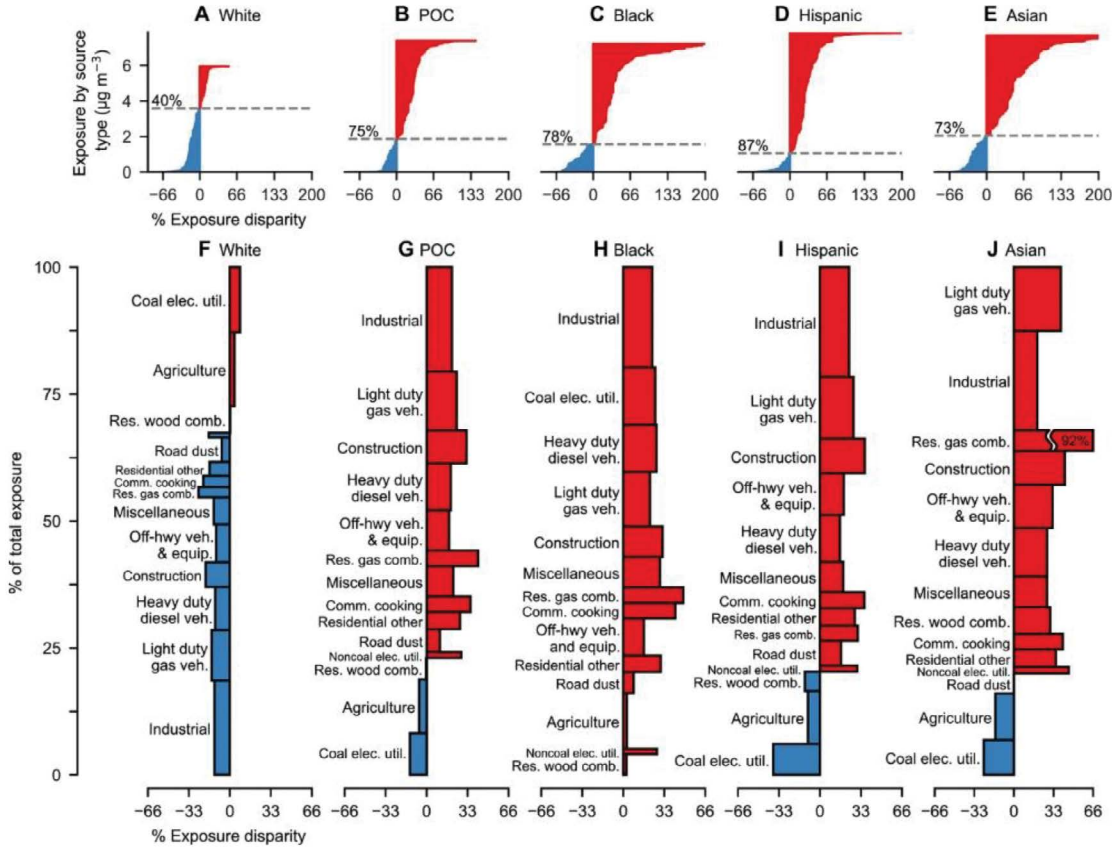
In the United States, methane accounts for approximately 10% of human-caused or anthropogenic greenhouse gas emissions.[2] However, methane is a "short lived climate forcer" (SLCF), which makes it a particularly destructive greenhouse gas. As the United Nations' Intergovernmental Panel on Climate Change (IPCC) recently explained, one ton of methane in the atmosphere has about 80 times the warming impact of a ton of CO_2, and "[o]ver time scales of 10 to 20 years, the global temperature response to a year's worth of current [methane] emissions . . . is at least as large as that due to a year's worth of CO_2 emissions."[3] As a result, experts attribute approximately 30% of today's anthropogenic climate change to methane emissions.[4]

In addition to its climate impacts, methane poses acute and chronic hazards to human health. Methane is flammable and explosive within certain ranges and thus can present a safety hazard for individuals in areas with high methane concentrations including, for example, around oil and gas facilities, certain agricultural settings, and coal mines. Methane gas intoxication can cause asphyxia and lung injury, and the explosive hazards posed by methane can be deadly.[5] Ruptures and other incidents on large-diameter, high-pressure natural gas pipelines can have potentially catastrophic consequences.[6]

Methane emissions also contribute to ozone formation,[7] which is linked to a variety of serious public health effects, including reduced lung function, asthma attacks, asthma development, emergency room visits and hospital admissions, and early death from respiratory and cardiovascular causes. A 50% reduction in global methane concentrations would result in dramatically lower ozone concentrations, in the range of 1.5 to 2.5 ppb, and lead to 100,000 fewer premature respiratory deaths due to ozone exposure globally.[8] Reducing 1 million tons of methane emissions has been estimated to lead to a reduction of 240 to 590 premature deaths worldwide.[9]

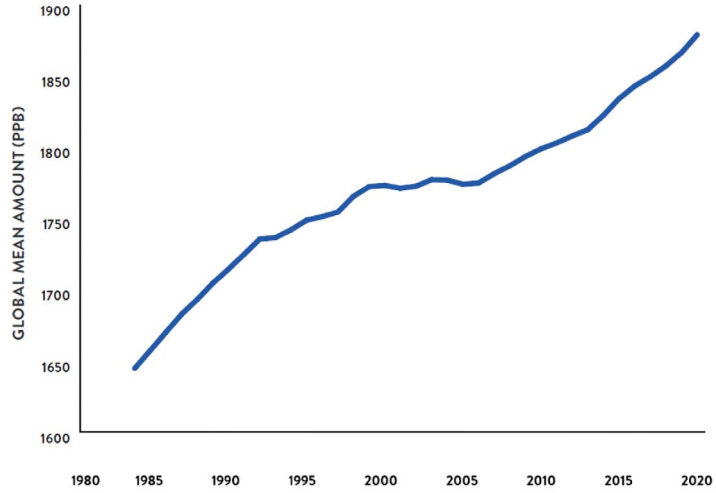
Methane also typically is co-produced with other harmful air pollutants. The process to extract oil and gas, for example, also generates volatile organic compounds, which are a key ingredient in ground-level ozone (smog) and air toxics such as benzene, toluene, ethylbenzene, and xylene. Smog is a dangerous pollutant that can harm respiratory systems, aggravating lung diseases like asthma and acute cardiovascular effects, and air toxics are known or suspected to cause cancer and other serious health effects.[10] A recent study found that ultra-fine particulate matter emitted from fossil fuel combustion is responsible for 1 in 5 premature deaths worldwide, including more than 300,000 deaths a year in the United States.[11]

Given these facts, it should come as no surprise that communities located near areas of high methane production often face impacts from methane and other pollutants that result in poor health outcomes, reductions in property values, and decreases in quality of life. More than 50 million Americans, for example, live in counties with oil and gas production facilities and where federal air quality standards are not being met.[12] These impacts are not felt equally; communities of color bear the brunt.[13] In San Juan County, New Mexico, for example, over half the Native American population lives within one half mile of an oil and gas production facility.[14] The county, which includes Navajo Nation lands, has the second highest methane emissions levels in the state, and sits under an ozone cloud estimated to comprise 10% of the country's methane emissions.[15]



Source: C. W. Tessum et al. 2021. PM2.5 polluters disproportionately and systemically affect people of color in the United States. Sci. Adv. 7 (18). https://doi.org/10.1126/sciadv.abf4491.

Despite the potential dangers associated with methane emissions, the trends are heading in the wrong direction. Absent additional action, global methane emissions are projected to increase through at least 2040.[16]

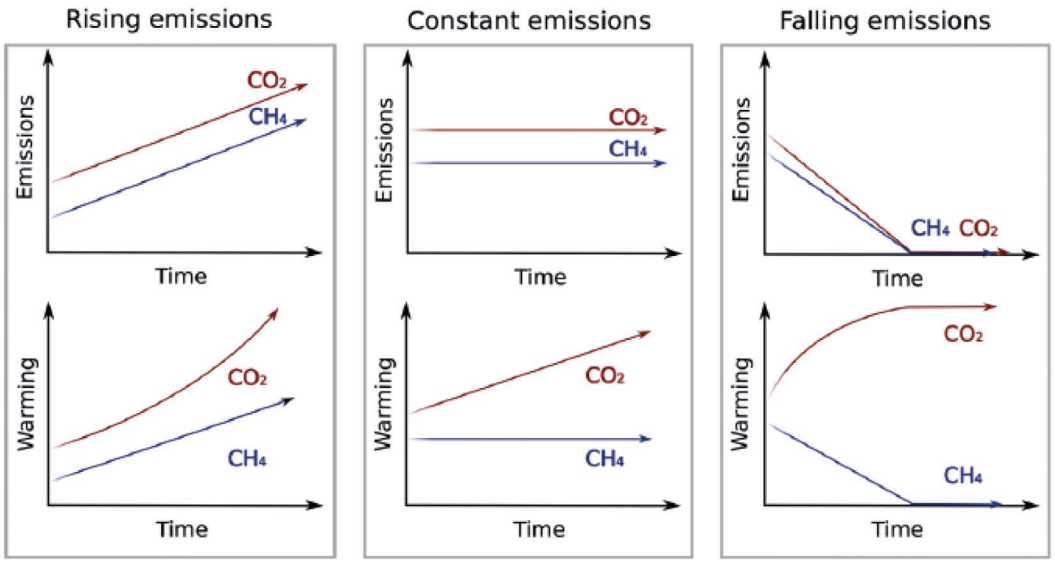


Global mean methane amount, 1984–2019, parts per billion

[Source: Ed Dlugokencky, NOAA/ESRL (www.esrl.noaa.gov/gmd/ccgg/trends_ch4/)]

Despite the daunting trend line, some positive developments in recent years provide a source of optimism and, more importantly, a robust basis on which to build methane reduction efforts.

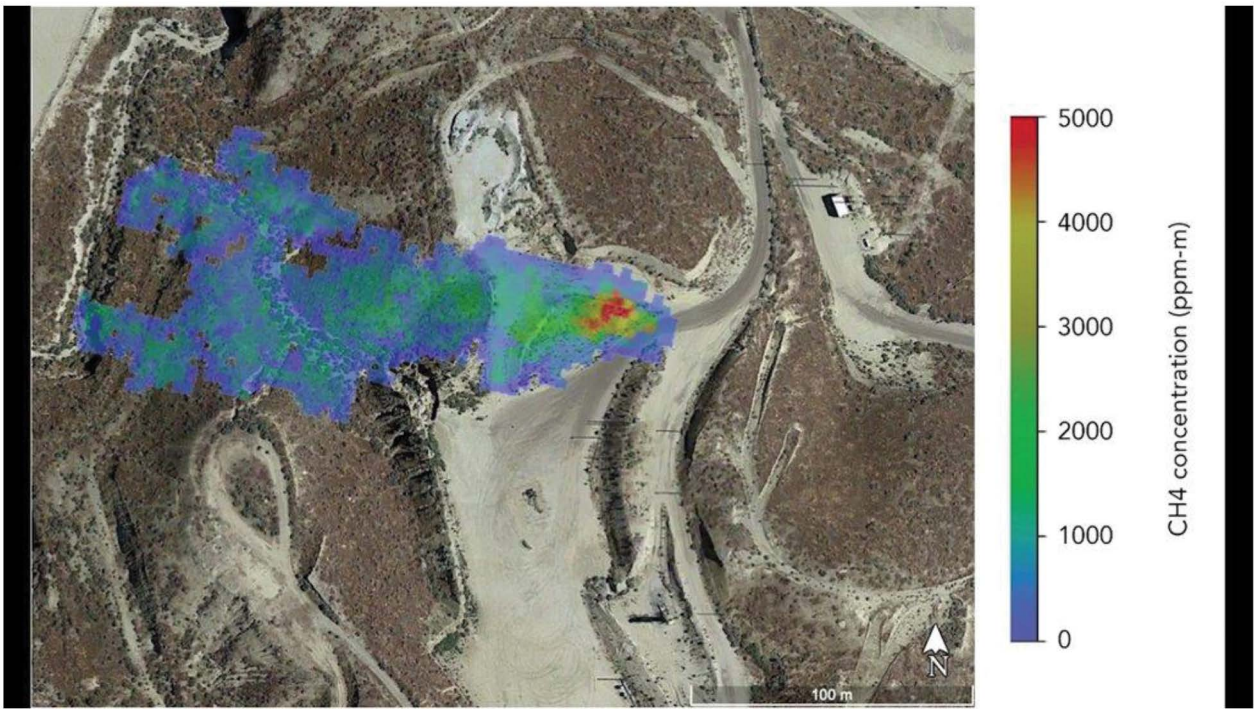
Because methane is a super-pollutant that disproportionately impacts climate change in the near term, the benefits of near-term reductions also are commensurately large. That is, reducing methane emissions today can generate near-immediate climate benefits, providing room for the longer-term transition to a clean energy economy, as illustrated in the chart below.



Source: Oxford Martin School Briefing Memo, 2017

Significant advances in data collection and technology over the past few years have greatly increased our ability to detect and quantify methane releases due to leaks in pipelines or other infrastructure, intentional or unintentional venting, or other sources. These recent technological innovations are improving our ability to detect and quantify methane from a wide range of sources and to reduce or eliminate methane sources that otherwise might go undetected, potentially for years. With respect to methane sources in the oil and gas sector, for example, we also have learned that a relatively few "super emitters" are responsible for a disproportionate share of overall methane emissions—providing opportunities for more efficient, targeted emissions reduction strategies and, in many cases, an economic incentive to quickly repair leaks.[17]

For example, in 2023, the non-profit Carbon Mapper, in partnership with NASA's Jet Propulsion Laboratory, is launching prototype satellites to track methane emissions at individual facilities.[18] This and related efforts are yielding high-resolution images capable of identifying previously undetectable sources of methane, with the data being made accessible to all interested users and empowering key decisionmakers in the public and private sectors.



A methane plume detected by NASA's AVIRIS-NG in summer 2020 indicates a leaking gas line in oil field in California. The operator subsequently confirmed and repaired the leak.

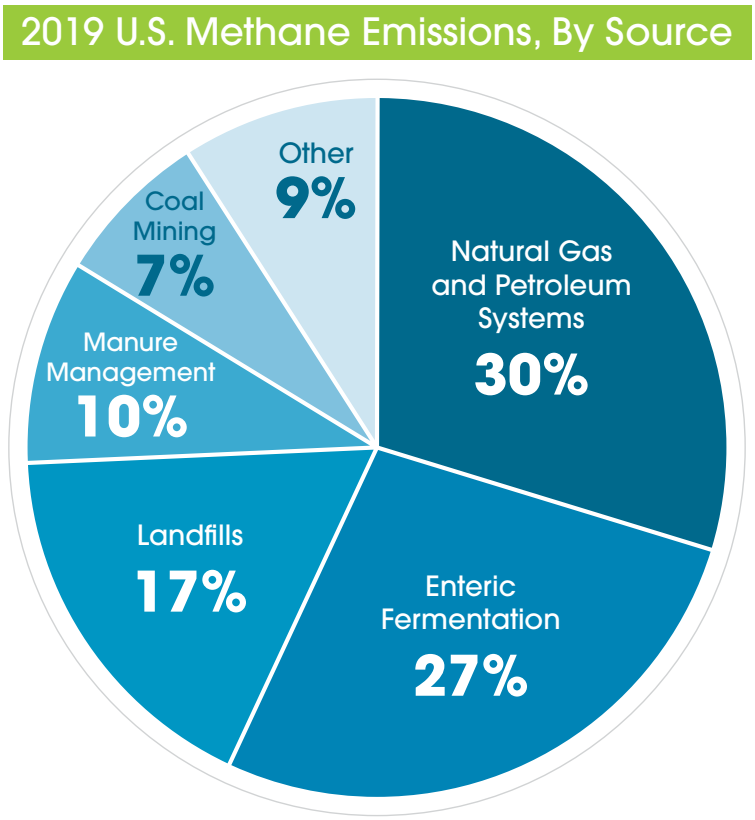
Credit: NASA/JPL-Caltech

Importantly, scientific and technological advances, many of which were spurred in part by federal investments, have enabled more effective measurement of methane, and cost-effective tools for mitigating those sources of emissions. Innovation and cost declines in everything from emissions-sensing equipment to zero-emissions pneumatic equipment means that industries can now capture greater economic benefits while reducing harmful methane pollution.

Finally, system-wide and full life-cycle methane emissions reduction can create tens of thousands of good-paying, union jobs across the country.[19] The new leak detection technology discussed above, for example, is creating significant new employment opportunities for thousands of new leak detection and repair workers. The methane emissions mitigation industry is rapidly growing, along with the jobs associated with this field. Over 225 U.S. companies across the country are manufacturing the technologies and providing services to reduce oil and gas leaks across 47 states. Methane emissions reductions will increasingly employ welders, pipeline workers, electricians, inspectors, engineers, and a broad range of construction and building trades workers. The median wage in the methane mitigation sector is nearly $31 an hour, which is 60% higher than the U.S. average.[20] Many jurisdictions have already enacted strong methane mitigation measures, with positive economic and employment effects. Methane leak detection and repair should incorporate contractor and workforce standards to ensure high-quality work and effective emissions reductions.

III. GETTING THE JOB DONE: U.S. ACTIONS TO REDUCE METHANE EMISSIONS

The *Action Plan* is geared toward reducing methane emissions for the United States' sources: oil and gas sector; landfills; agriculture; and coal mining.



U.S. Environmental Protection Agency (2021). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2019

A. REDUCING METHANE EMISSIONS IN THE OIL AND GAS SECTOR

The oil and gas sector is the largest industrial source of methane emissions in the United States, responsible for approximately 30% of total methane emissions.[21] That is why on January 20, 2021, President Biden issued Executive Order 13990, which directed the EPA to issue regulations under the Clean Air Act to reduce the oil and gas industry's methane emissions.[22] This is a foundational element of a whole-of-government effort, which will generate substantial health and safety benefits, while creating thousands of new jobs to detect and repair leaking equipment and remove and/or replace old and dangerous gas infrastructure that is past its rated lifetime.

1. UPDATED RULES OF THE ROAD FOR NEW AND EXISTING OIL AND GAS SOURCES

EPA is proposing emissions guidelines and new source performance standards under the Clean Air Act that would significantly reduce methane emissions and other harmful pollutants from the oil and gas sector. There are three primary components to EPA's proposal:

- EPA's proposal would update and strengthen current requirements for new sources, broaden the types of sources covered by those standards, and encourage the development and deployment of cost-effective technologies to further reduce pollution from oil and natural gas sources. The proposal also would regulate additional types of sources for the first time, including well liquids unloading, natural gas-driven intermittent vent pneumatic controllers, and oil wells with associated gas.
- EPA's proposal defines guidelines for states to follow in their programs to reduce emissions from existing oil and gas facilities. This will be the first such rule covering methane emissions from existing sources in the oil and gas sector. The proposal, which covers many of the same types of facilities and operations covered in the new source rule, will require, among other things, rigorous leak detection and repair at well sites and compressor stations, widespread conversion of pneumatic controllers to zero-emitting technologies, and the elimination of associated gas venting.

- EPA is also seeking information that may help the agency identify cost-effective ways to make important, additional reductions in methane and VOC emissions from the oil and natural gas industry, which the agency intends to address in a supplemental proposal in 2022. This includes several types of sources that are not currently regulated, including abandoned and unplugged wells, pipeline pigging and related blowdown activities, and tank truck loading operations. The agency is also seeking information to empower local communities to address local emission concerns by defining roles that communities can play in identifying large leaks and alerting companies to help ensure they are fixed.

Overall, the proposed requirements would reduce by approximately 75% emissions from the sources, equipment, and operations that the proposal covers. Those reductions would total 41 million cumulative tons of methane between 2023 and 2035, the equivalent of 920 million metric tons of CO_2. The proposal would also reduce 12 million tons of smog-forming VOCs along with 480,000 tons of reductions in air toxics as a co-benefit of reducing VOCs. If EPA ultimately finalizes some of the ideas that the agency is taking comment on for a supplemental proposal, these pollution reduction totals could increase.

By limiting methane emissions leaks from multiple sources in the oil and gas sector, EPA's critical and commonsense steps would result in the capture of gas that otherwise would be lost, conserving finite natural gas resources, while reducing air pollution. At the same time, the industry's new obligations to detect and repair methane leaks will create new, good-paying jobs.

2. REDUCING VENTING, FLARING, AND WELL LEAKS ON PUBLIC LANDS AND WATERS

The Department of the Interior's Bureau of Land Management (BLM) and Bureau of Ocean Energy Management (BOEM) have the responsibility to manage oil and gas operations that take place on public lands and in federal offshore waters. Both bureaus are taking steps to reduce methane emissions from industry activities on public lands and waters. They are focusing on the wasteful venting and flaring of gas during drilling operations, and on poorly-performed well closures, which can result in continuing releases of methane.

- The BLM is planning a regulation under the Mineral Leasing Act to disincentivize excessive venting or flaring of gas by requiring oil and gas operators to pay royalties to the federal government for vented or flared gas. BLM estimates that in 2019, approximately 150 billion cubic feet of methane were flared from operations that would be subject to the BLM regulation—more than the entire yearly natural gas consumption of residential consumers in the state of Wisconsin.[23] Also, recent research indicates that the level of un-combusted methane in flares is higher than expected,[24] meaning that flaring operations involve some direct venting of methane into the atmosphere.
- The BLM and BOEM are planning to strengthen financial assurance requirements for oil and gas operators, which will ensure that wells are properly plugged and reclaimed, preventing long-term leaks of methane or other contaminants.

3. BOOSTING SAFETY OF GATHERING AND TRANSMISSION PIPELINES

The Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA) has substantial authority to protect people and the environment by reducing or eliminating leaks or ruptures of oil and gas pipelines, at underground natural gas storage facilities, and from liquified natural gas (LNG) operations. PHMSA's jurisdiction extends to approximately 3 million miles of oil and gas pipelines and hundreds of underground gas storage and LNG facilities that emit large quantities of methane.

As part of implementing the bipartisan PIPES Act, PHMSA is advancing a commonsense regulatory agenda that has the potential to provide annual methane reductions of as much as 20 MMT of CO_2e in methane emissions per year—a spur for new jobs for pipeline workers, welders, electricians, and other trades. The reductions will be achieved by reducing leaks throughout the gas pipeline system and by reducing the frequency and scope of ruptures. In addition to being a major safety hazard, ruptures are a particularly large source of pipeline methane emissions. More than 1,000 metric tons of methane are lost, on average, with each pipeline rupture. A single rupture from a large, high-pressure gas pipeline can release more than 1,300 metric tons of methane emissions.[25]

In the coming months, PHMSA anticipates finalizing three critical and commonsense rules to advance its ambitious environmental and safety agenda:

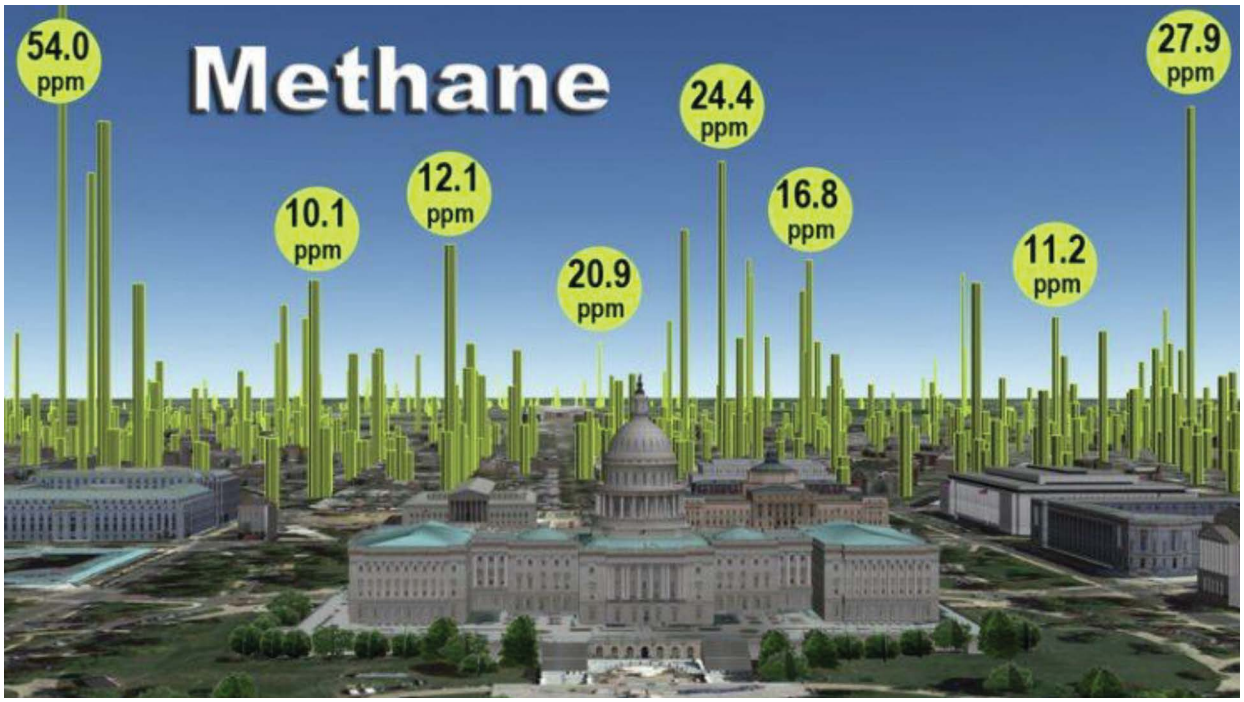
- **Gas Gathering Pipeline Safety Rule.** This rule proposes to impose new requirements on more than 400,000 additional miles of previously unregulated pipelines, including new safety requirements for a substantial portion of these lines, which will result in significant reductions in greenhouse gas emissions associated with leaks and incidents.
- **Automatic Shut-off Valve Rule.** This rule, which is also known as the Valve Installation and Minimum Rupture Detection Standards rule, proposes to require operators of newly constructed and entirely replaced large diameter pipelines to install rupture mitigation valves or alternative equivalent technologies, and will establish minimum performance standards for those valves' operation. The rule also will likely address requirements for rupture-mitigation maintenance, inspection, and risk analysis.
- **Gas Transmission Pipelines Safety Rule.** This rule proposes to reduce the frequency of leaks and ruptures on more than 300,000 miles of gas transmission lines by addressing integrity management provisions, management of change processes, gas transmission pipeline corrosion control requirements, requirements for inspections following extreme events, strengthened integrity management assessments, and repair criteria for high consequence (heavily populated) areas.

PHMSA also will be proposing a rule next year to strengthen standards for LNG facilities:

- **LNG Facilities Rule.** This planned new rule would strengthen standards for LNG facilities, particularly from large scale incidents and storage tanks, which are a major source of methane emissions. The proposed rule would seek to prevent large-scale incidents like the 2014 LNG incident in Plymouth, Washington, which emitted 3,246 metric tons of methane. It also would reduce the risk of low probability/high consequence incidents, such as an LNG storage tank failure. Such tanks can contain as much as 69,000 metric tons of methane. [26]

4. REGULATORY, DISCLOSURE, AND PARTNERSHIP INITIATIVES TO REDUCE METHANE LEAKS AND RUPTURES ON DISTRIBUTION LINES

There are an estimated 2.3 million miles of gas distribution pipelines that extend into cities and towns throughout the United States. Many of these pipelines are old, leaking, and susceptible to rupturing.[27] For example, the chart below from testing in Washington, D.C. illustrates chronic leakage problems in gas distribution pipelines.[28]



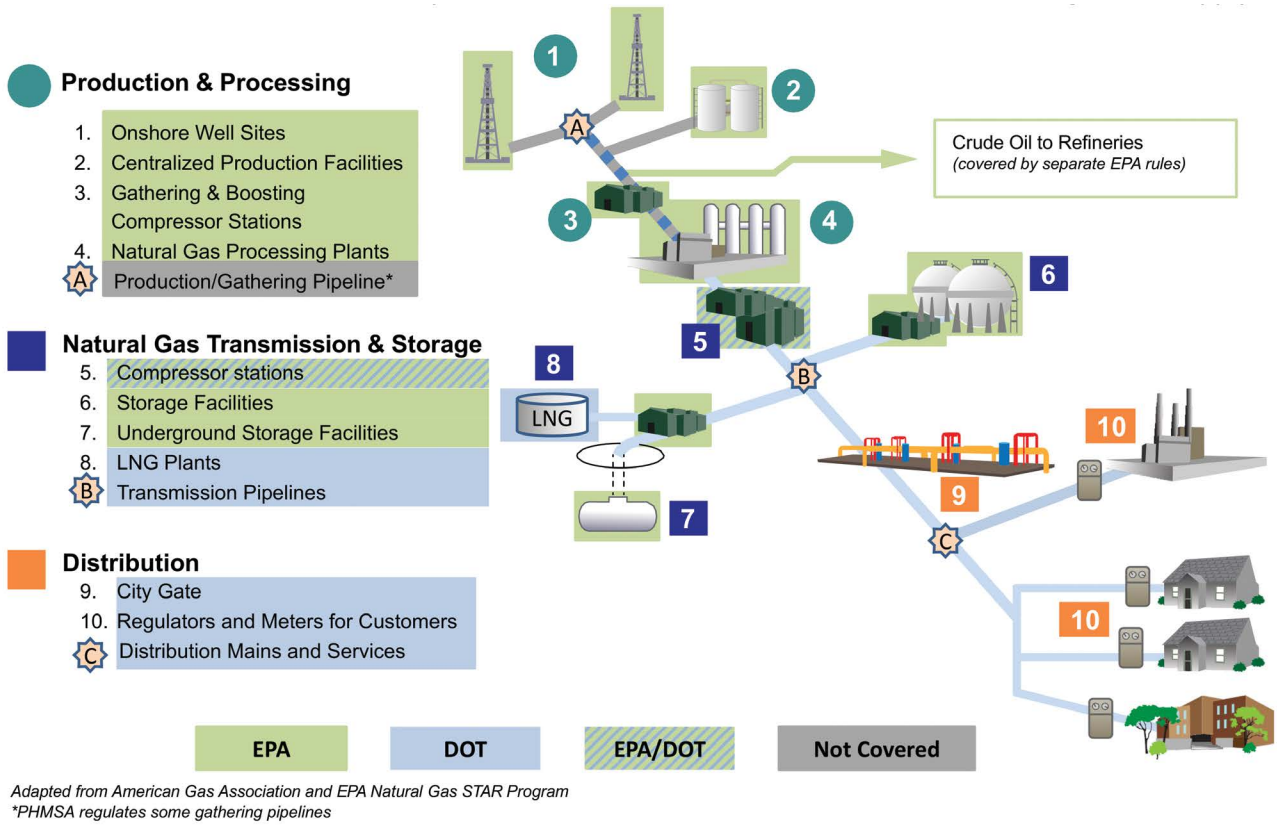
Another recent study published in the Proceedings of the National Academy of Sciences reinforces concerns about gas leakage. The study monitored methane emissions in the Boston area between 2012 and 2020, and found that an average of 49,000 tons of methane leaked into the air each year. That accounts to an estimated 2.5% of all gas delivered to the metro area and is equivalent to the carbon dioxide emissions from roughly a quarter-million cars operating for a year.

In addition to on-going leaks, gas distribution pipelines can fail and generate enormous emissions. A single catastrophic incident in 2018 in Merrimack Valley, for example, released an estimated 13 metric tons of methane.[29]

Despite this challenging fact pattern, when aging or damaged gas distribution pipelines are repaired or replaced, methane emissions can be cut by up to 90%.[30] These improvements are good for consumers, safety, and the climate. That is why the Biden-Harris Administration is confronting the serious environmental and safety issues associated with methane emissions and ruptures in distribution pipelines:

- Next year, PHMSA will be proposing a new Gas Distribution Pipelines Safety Rule to substantially upgrade pipeline safety practices for gas distribution pipelines. This planned new rule would achieve methane reductions through reduced ruptures, incidents, and response times.
- Next year, PHMSA will also be proposing a Methane Leak Detection Repair Rule that would establish standards for leak detection technologies and practices and require repair of all leaks. PHMSA estimates that these amendments would reduce methane emissions by 294,269 to 832,467 metric tons of CO_2e each year, depending on the assumed leakage rates for cast iron and plastic distribution pipelines.
- The Administration will also work with local governments, community leaders, labor unions, NGOs, and other stakeholders to set up monitoring systems for methane and other greenhouse gases to identify and publicly post methane leaks in municipal distribution systems. The Administration also will challenge members of the U.S. Climate Alliance and Climate Mayors to prioritize the abandonment or replacement of gas distribution pipelines across America. All of these efforts will result in new work for pipeline and construction workers across America.

Crude oil and natural gas industry: Where EPA and DOT methane emissions rulemakings would apply



Adapted from American Gas Association and EPA Natural Gas STAR Program
**PHMSA regulates some gathering pipelines*

Illustration of regulatory coverage of methane emissions from the oil and gas supply chain

5. PLUGGING ABANDONED OIL AND GAS WELLS TO REDUCE METHANE EMISSIONS

Methane emissions from abandoned oil and gas wells are a significant source of U.S. climate pollution. The EPA estimates that the United States has around 2.7 million abandoned oil wells and 600,000 abandoned gas wells, of which approximately 40% (1.6 million oil wells and 380,000 gas wells) are unplugged and may be continuously emitting methane.[31] EPA has estimated that these abandoned oil and gas wells, including those that are orphaned or idle,[32] emitted 263,000 metric tons of methane (6.6 million metric tons of CO_2e) in 2019.[33] In addition to emitting methane, unplugged or poorly plugged wells also can allow petroleum products to leach into underground aquifers, release hazardous air pollutants that can lead to increased levels of ground-level ozone, and cause methane to concentrate inside homes and buildings, creating a risk of explosion. This is of particular concern to the estimated 9 million Americans who live within a mile of the documented 81,000 orphan wells—which are inactive, unplugged, and have no solvent owner of record.[34] People of color and low-income individuals are more likely to be included in this population, making this an important environmental justice issue.[35]

President Biden has proposed an aggressive program to plug orphan oil and gas wells as a key part of his Build Back Better agenda. The Infrastructure Investment and Jobs Act (IIJA) includes a $4.7 billion well plugging program that, if enacted, will commission the Department of the Interior to direct well plugging activities on federal, state, private, and Tribal lands. In doing so, priority will be given to the identification and plugging of super-emitters to maximize methane reductions that will be achieved under the program. The Department also may pursue opportunities to stretch program funds by enabling other entities to monetize the capture and destruction of methane from select wells, with receipts then applied to the plugging of additional wells.

B. ADMINISTRATION ACTIONS TO REDUCE METHANE EMISSIONS FROM LANDFILLS

1. REDUCING METHANE EMISSIONS FROM LARGE LANDFILLS

The EPA has authority under the Clean Air Act to reduce methane emissions from landfills—a major source of methane emissions that is responsible for 17% of overall U.S. methane emissions.[36] In 2016, EPA issued revised guidelines to reduce emissions of landfill gas, including methane, from large landfills.[37] It lowered the emissions threshold for installation of a gas collection and control system, thereby requiring landfills to collect and control their emissions earlier. The 2016 rule set a series of near-term deadlines for states to develop plans for implementing the guidelines and for the EPA to approve or disapprove them. If states fail to submit adequate plans on a timely basis, the Clean Air Act requires that EPA regulate existing landfills through a federal plan.

The Biden-Harris Administration has started to build on this foundation. It finalized a new federal plan in May 2021, establishing revised standards for landfills in areas without a state or Tribal implementation plan, and ensuring that existing large municipal landfills in the United States will be required to significantly reduce their methane emissions. An estimated 1,500 landfills are covered by the final federal plan.[38]

As a complement to EPA's updated landfill regulations, EPA's voluntary Landfill Methane Outreach Program (LMOP) supports development of landfill gas energy projects by providing technical support at regulated landfills and helping smaller, unregulated landfills collect and direct methane gas into the renewable gas energy marketplace.[39] This support includes connecting landfill owners and operators with LMOP Partners experienced in project development, providing technical tools and resources to facilitate project development.

The Biden-Harris Administration is putting a new emphasis on LMOP as a key part of an overall strategy to achieve a gas capture and flare rate for all landfills—including both unregulated smaller landfills and landfills subject to regulatory collection and combustion—of 70% nationally, a 12% increase from the current rate.

2. REDUCING FOOD WASTE IN LANDFILLS

An estimated 30%-40% of the food produced in the United States is lost or wasted. Excess methane emissions are among the many negative impacts associated with America's food waste problem. In particular, food is the most common material found in landfills, constituting an estimated 24% of the material in our landfills. As it decomposes, food waste generates large quantities of methane emissions that are not being fully captured.

Past administrations have recognized that food waste presents environmental issues in addition to economic and equity issues. In 2015, for example, EPA and USDA set a national goal to reduce food loss and waste by 50% by 2030 through a collaborative approach both domestically and internationally. The agencies subsequently formed joint programs and pursued food loss and waste actions such as education and outreach, research, community investments, voluntary programs, and public-private partnerships. [40]

Under the Biden-Harris Administration, USDA, EPA, and the U.S. Food and Drug Administration (FDA) are working more closely than ever to make the goal of 50% reduced food loss and waste by 2030 a reality. The Administration's vision for reducing food loss and waste seeks to improve food security and nutrition, increase farmer income and rural prosperity, reduce pressure on natural resources, and meet greenhouse gas emissions reduction targets.

C. REDUCING METHANE EMISSIONS BY REMEDIATING ABANDONED COAL MINES

Abandoned coal mines are a significant source of methane emissions that are estimated to be producing 237,000 metric tons of methane (5.9 MMT CO_2e) on an annual basis.[41] As with orphan oil and gas wells, President Biden has proposed an aggressive program to remediate abandoned coal mines as a key part of his Build Back Better agenda. Congress responded by providing $11.3 billion in the Infrastructure Investment and Jobs Act for the Abandoned Mine Land (AML) grant program, which will allow for the remediation of most of the currently known coal AML sites throughout the country and potentially additional mining sites, creating jobs and helping to reduce methane emissions from unremediated, abandoned underground mines and spurring economic revitalization. Further, the Build Back Better agenda would prioritize grants to reclamation projects that employ dislocated energy workers, and encourage meaningful engagement with communities about projects.

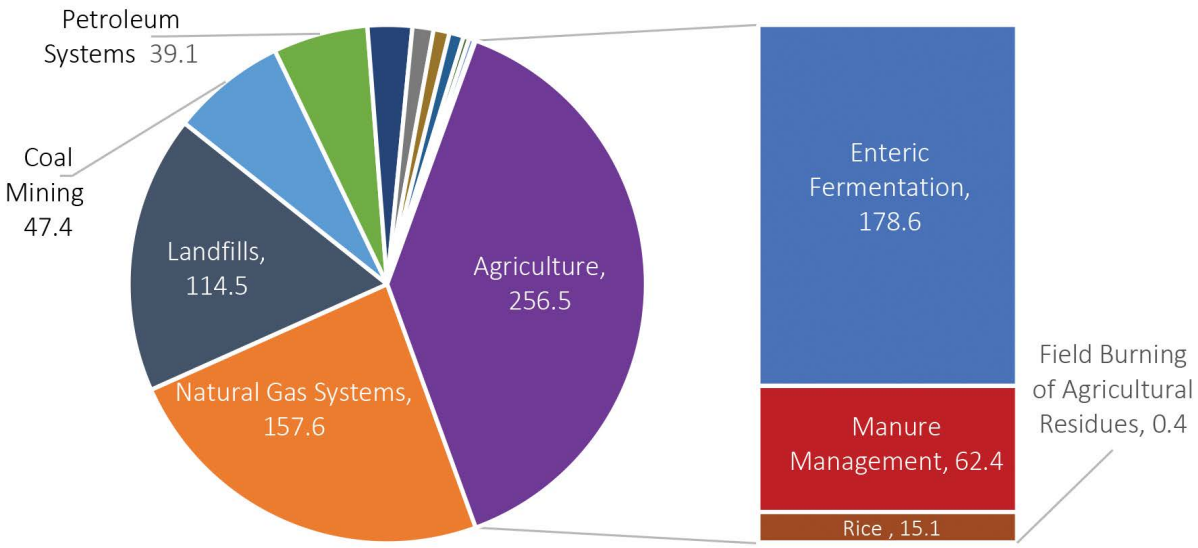
These funds build upon the existing AML grant program, through which the Department of the Interior's Office of Surface Mining Reclamation and Enforcement (OSMRE) has already provided more than $8 billion. OSMRE also manages the Abandoned Mine Land Economic Revitalization (AMLER) grant program, which provides grants—including $115 million in fiscal year 2021—to the six states and three Tribes with the greatest amount of unfunded AML problems for projects that support both reclamation and local economic development.[42]

These investments are supported by the Biden-Harris Administration's Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization, which was established to provide federal leadership in partnership with coal, oil and gas, and power plant communities to create good-paying union jobs, spur economic revitalization, remediate environmental degradation, and support energy workers. To date, the Interagency Working Group has engaged thousands of state, local, and Tribal officials, labor unions, business leaders, environmental justice organizations, and community groups in key energy communities to inform the working group's efforts to further coordinate federal resources.

D. EXPANDING INCENTIVE-BASED AND VOLUNTARY PARTNERSHIP EFFORTS TO REDUCE METHANE EMISSIONS FROM AGRICULTURE

Agriculture is a major source of methane emissions in the United States. The three largest sources of emissions from agriculture include manure management, enteric fermentation from domestic livestock, and rice cultivation.[43]

U.S. Methane Emission Sources, 2019 (Million Metric Tons of CO_2e)



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

From day one, President Biden has recognized that America can recruit farmers and ranchers to implement "climate-smart" practices that will reduce greenhouse gas emissions, enhance carbon sequestration, and grow biofuels to substitute for fossil fuels. In his early Executive Order on "Tackling the Climate Crisis at Home and Abroad," the President called on USDA to work with farmers and ranchers to identify voluntary, incentive-based approaches that will advance climate goals.[44] In response, the USDA is pursuing multiple workstreams to reduce methane emissions from the agricultural sector, including (1) the adoption of alternative manure management systems and other methane-reducing practices; (2) the expansion of on-farm generation and use of renewable energy; (3) the development of a climate-smart agricultural commodities partnership initiative; and (4) increased investments in agricultural methane quantification and related innovations.[45]

1. ADOPTING ALTERNATIVE MANURE MANAGEMENT SYSTEMS AND OTHER METHANE-REDUCING PRACTICES

The USDA is leveraging its authority under a variety of existing programs to encourage farmers and ranchers to install or upgrade equipment and/or adopt new practices that improve manure management and can substantially reduce methane emissions, in a way that also advances environmental justice. The Natural Resources Conservation Service (NRCS), for example, will provide incentives and technical assistance through Farm Bill programs such as the Environmental Quality Incentives Program (EQIP) and the Conservation Stewardship Program (CSP) to upgrade existing anaerobic lagoons by installing covers and collecting methane for use or destruction; installing anaerobic methane digesters that collect methane for use or destruction; install solid separators that reduce methane-producing slurries; providing conservation assistance for transitions to alternative manure management systems, such as deep pits, composting, transitions to pasture, or other practices that have a lower greenhouse gas profile; and supporting rice management that reduces methane emissions, such as alternate wetting and drying.

Several other USDA programs will support methane reducing practices and projects, including the Rural Business Cooperative Service (RBCS), which can provide grants, guaranteed loans, and technical assistance to support anaerobic digester (AD) projects; the Biorefinery, Renewable Chemical, and Biobased Product Manufacturing (Section 9003) Program; the USDA's Risk Management Agency (RMA); and the Rural Energy for America Program (REAP). EPA also works closely with USDA in administering these programs to reduce methane emissions through its voluntary AgSTAR Program.

Over time, these programs have made progress in providing financial incentives to reduce methane emissions from manure management and other methane-producing agricultural practices. Now, the Biden-Harris Administration is redoubling efforts and raising ambition on "climate-smart" agriculture. It is expanding existing programs, and launching new initiatives that will generate major additional reductions in methane emissions from the agricultural sector.

The FY 21 budget provides an initial window into the level of its ambition. For example, over a ten-year period (FY 10-FY 20), RBCS supported $117 million in loans and grants to support methane-reducing anaerobic digester projects. In FY 2021, it upped its support for loans and grants for these purposes to $240 million. Likewise, the USDA introduced a $10 million EQIP Climate Smart Agriculture and Forestry pilot sign-up in FY 21 that specifically targets anaerobic digesters and select rice practices to reduce methane emissions. In FY 22, this program will be scaled up nationwide to support additional prioritization of methane reductions.

The Build Back Better agenda provides additional evidence of its high level of ambition to reduce methane emissions in agricultural operations. The Administration has proposed funding that, cumulatively, would enable methane emissions reductions from manure, rice, and enteric sources by as much as 26 million metric tons in 2030 and a cumulative total of approximately 130 million metric tons CO_2e from 2030-2035.

To put these goals into context, reducing methane emissions from manure management systems at these levels is the equivalent of 500 farms installing anaerobic digesters; 1,200 farms installing lagoon covers with flares; and 250 farms installing solids separators.

2. LAUNCHING A CLIMATE-SMART PARTNERSHIP INITIATIVE

As a key part of its overall climate-smart agricultural strategy, the USDA is developing a partnership initiative that is seeking to establish new markets for agricultural commodities based on the climate benefits of agricultural products.[46] The backbone of the initiative is the identification, confirmation, and tracking of climate-smart agricultural practices and their climate benefits—including practices that reduce methane emissions. Pilots and demonstrations will finance the deployment of climate-smart agriculture practices like prescribed grazing on rangeland, anerobic digesters, and enhanced efficiency or reduced fertilizer use. The initiative aims to establish new metrics and procedures to ensure reliability, effectiveness, and transparency in certifying climate-benefitting practices and tracing them through commodity supply chains.

If successful, the program could build a stable platform for sustained climate action by hard-wiring significant reductions in greenhouse gas emissions and increased carbon capture in soils and other vegetation for large volumes of commodity agricultural products.

3. PROMOTING ON-FARM RENEWABLE ENERGY FROM METHANE

To help reduce methane emissions and scale up on-farm generation and use of renewable energy, USDA will be launching a new public-private partnership to promote biogas policies, programs, and research. Plans under evaluation include:

- Establishing an Interagency Biogas Opportunities Task Force that will provide recommendations to Congress on policy and technological opportunities to expand the biogas industry.
- Deepening USDA's engagement in the AgSTAR Program to develop detailed, technical outreach and training materials tailored to developers and agricultural producers, including workshops and contracts with institutions of higher education and trade associations.
- Launching an advisory committee to identify barriers to developing biogas recovery systems and areas in which more research is needed to expand the industry.
- Developing a communications strategy dedicated to highlighting the success of biogas recovery systems funded through USDA Rural Development Programs.

4. INCREASED INVESTMENTS IN AGRICULTURAL METHANE MEASUREMENT AND INNOVATIONS

To ensure the credibility of the Administration's climate-smart agricultural practices, the Administration will track emissions and removals from all sectors and sources, including agriculture. The initiative will bring together land management and science agencies to deploy validated, science-based greenhouse gas estimation methods, tools, and measurements for tracking greenhouse gas fluxes associated with agricultural, forestry, and other land-based practices.

Within the measurement and verification program, the USDA will take the lead in addressing agricultural methane quantification and reporting at the farm, program, and national scales. In particular, USDA's research agencies will conduct and sponsor research to assess the efficacy of methane reduction technologies, including feed additives and manure management systems. USDA also will improve and expand on conservation and farming practice surveys to better track changes in adoption rates over time. USDA will build and improve farm-scale decision support tools to help farmers quantify their greenhouse footprint and estimate the benefits of taking actions.

More generally, USDA will pursue a methane innovation agenda through its Agricultural Research Service's (ARS's) formation of a Climate Change Center of Excellence, which will build a research pipeline for methane reduction and other climate-smart farming technologies by establishing standardized research methodologies. The ARS's work will be complemented by the USDA's Economic Research Service, which will examine the proportions of different greenhouse gases emitted by stages of the food system supply chain, and assess the effectiveness of approaches to encourage the adoption of methane reducing technologies and practices. The National Institute of Food and Agriculture also will continue to invest in manure management and methane-related research, education, and extension projects, including offering competitively-funded grants on a wide range of topics including innovative approaches to manure management, feed formulation or use of novel alternative feedstuffs, rumen microbiology, and managing emissions to the atmosphere and hydrosphere in various animal production systems. USDA will continue to work collaboratively with the Innovation Center for U.S. Dairy and Dairy Management Inc. to improve the environmental footprint of the U.S. dairy industry, particularly with regard to reducing methane emissions.

Beyond USDA, the Department of Energy is also supporting innovative technologies for methane measurement across farming operations. DOE's Advanced Research Projects Agency-Energy (ARPA-E) is funding projects to quantify greenhouse gas emissions and soil carbon dynamics at the field level, through its SMARTFARM program (Systems for Monitoring and Analytics for Renewable Transportation Fuels from Agricultural Resources and Management).[47] SMARTFARM will continue to promote development of technologies to measure methane and other emissions from agricultural fields.

E. OTHER METHANE REDUCTION INITIATIVES

1. REDUCING METHANE EMISSIONS IN INDUSTRIAL APPLICATIONS

Natural gas use in the power sector and other industries has expanded rapidly in recent years. Limited data are available regarding potential losses of methane emissions in connection with these industrial uses of gas, but they undoubtedly are occurring.

The Administration is making robust investments to scale clean alternatives to methane-emitting technologies in the industrial sector, like efficiency, direct electrification, clean hydrogen, and carbon capture and permanent storage. Making these technologies widely available and affordable will reduce the need to rely on methane-emitting techniques in the industrial sector. In addition, the Administration will work with manufacturers to better understand existing reliance and inefficiencies associated with the use of gas.

Among other available tools, the Administration will deploy the Department of Energy's university-based Industrial Assessment Centers (IACs) through its Advanced Manufacturing Office to provide no-cost energy assessments to small- and medium-sized manufacturers across the country that can identify opportunities to improve productivity and competitiveness, reduce waste, and save energy. To date, nearly 20,000 IAC assessments have been conducted.[48] IACs can and should work with companies and universities to identify opportunities to address methane emissions that are associated with the use of natural gas in manufacturing processes. Investments like this make American businesses more competitive in the global marketplace, meaning more job growth right here in America.

The Administration also has announced a clean Hydrogen Shot to accelerate the deployment of affordable low-carbon hydrogen, which can be used to help decarbonize the industrial sector.[49] And the Administration's technology-inclusive approach to decarbonization of the power sector includes support for a number of zero-carbon, dispatchable, firm power options, including nuclear, geothermal, and carbon capture and permanent sequestration.

2. ADVANCING EMERGING EFFORTS TO REDUCE METHANE EMISSIONS IN BUILDINGS

New evidence indicates that methane emissions from commercial and residential buildings that rely on gas for heating can be significant due to leakage, venting prior to ignition and—like gas flaring—burner malfunctions, and/or incomplete combustion. These methane emissions, spread over the tens of millions of structures that are hooked up to gas lines, may be cumulatively significant in terms of climate damage.[50] They also pose safety and potentially serious health risks due primarily to the substantial quantities of nitrogen oxides (NO_x).[51] For example, gas-fired space and water heaters in the United States emitted over 320,000 tons of NO_x in 2017—more than twice the amount attributable to gas-fired power plants in that year.[52]

Building electrification provides one potential strategy to avoid these methane emissions. DOE recently launched the Initiative for Better Energy, Emissions, and Equity, a national research initiative focused on deploying clean and efficient building heating and cooling systems.[53] DOE is also launching new appliance and equipment standards to advance heat pump technology and induction stoves. Additionally, HUD continues to partner with DOE on green building and building decarbonization initiatives, including the Better Buildings Challenge.

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2 EPA. *Inventory of U.S. Greenhouse Gas Emissions and Sinks:* 1990-2019 (Apr. 2021). *https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2019*.

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4 Methane and its byproduct were responsible for 0.97 W/m2 of radiative forcing in 2011. Source: IPCC, Fifth Assessment Report, Working Group I (AR5 WGI, Chapter 8, Table 8.SM.6)[4] *https://www.ipcc.ch/report/ar5/wg1/*; see also *https://www.unep.org/resources/report/global-methane-assessment-benefits-and-costs-mitigating-methane-emissions?__cf_chl_managed_tk__=pmd_kIV7g0qro37Br.pft6AALmDD6BPb42BQ0lkG2SuFfGk-1632076284-0-gqNtZGzNA2WjcnBszQc9*

5 *https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3617131/*

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12 *https://www.edf.org/sites/default/files/content/methane_rule_health_fact_sheet_reboot_final_no_citations.pdf*

13 *https://www.epa.gov/haps*

14 *https://www.scientificamerican.com/article/methane-cloud-sitting-over-u-s-southwest-threatens-indigenous-residents/*

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