



Preserving Air Quality, Reducing Emissions

To help sustain air quality and reduce emissions, Chesapeake announced a series of corporate goals and actions to achieve net zero direct greenhouse gas (GHG) emissions by 2035.

Goal	Net zero direct GHG emissions by 2035
Pathway to Achievement	<ul style="list-style-type: none"> Eliminate routine flaring on all wells completed from 2021 forward (enterprise-wide by 2025) Reduce methane intensity to 0.09% by 2025 — ACHIEVED (volume methane emissions/volume gross natural gas produced) Reduce GHG intensity to 5.5 by 2025 — ACHIEVED (tCO₂e/gross mboe produced)

To achieve our pledges and reach our goal of net zero emissions, Chesapeake takes a thoughtful, integrated approach.

An Integrated Approach to Reducing Emissions

Innovation	Best Practices	RSG Certification	Research	Policy
Identify and adopt technology to drive down our emissions profile	Reduce emissions through facility design, routine inspections, monitoring, data efficacy and field-level training	Certify production across two major shale basins (first operator to do so); continue expanding learnings to other assets	Participate in scientific research to better characterize air pollution, emissions and climate implications	Collaborate with government organizations and other stakeholders for science-based regulation

Compliance

Chesapeake's robust air program has regulatory compliance at its foundation. We utilize an electronic compliance management system that allows task tracking, report generation and emissions calculations to facilitate compliance with state and federal requirements, as well as integration with maintenance tasks and inspections with field employees.

Regulations are specific to the sources and pollutants emitted. At the federal level, the National Emission Standards for Hazardous Air Pollutants and the New Source Performance Standards are EPA rules and regulations that govern our operations. Each state has its own regulations, many of which require emissions inventories that account for the amount of pollutants released into the atmosphere.

We support science-based regulation of our operations, including the federal regulation of methane that we believe promotes natural gas as an integral part of a lower carbon future.

To ensure awareness of site emissions compliance, we conduct on-site training — meeting with operators in the field and walking them through facilities to identify emissions sources and how to maintain operational and recordkeeping emissions requirements. Approximately 225 field employees and contract operators participated in this training in 2021.

Smart Design Reduces Emissions

Although operational compliance is the fundamental goal of our air program, we also voluntarily implement measures to reduce emissions from the inception of our facility design.

Emissions Reduction and Management Practices

- Automatic tank gauging
- Leak detection and repair (LDAR)
- Piloted flyovers for leak detection
- Preventive maintenance practices
- Increased pipeline infrastructure
- Solar and wind-powered equipment
- Electric distribution systems
- Pneumatic controller emissions reduction
- Elimination of high bleed pneumatic devices
- Remote facility monitoring and shut down
- Vapor recovery
- Use of diesel-alternative fuels
- Green completions
- Limiting emissions during liquids unloading

On new facility builds, we install internally coated pipe to prevent corrosion and maintenance issues. This application also results in better overall system performance, leading to enhanced emissions reduction and reduced maintenance expenses.

Monitoring and Maintenance

Regular site inspections are an important step to identify potential emissions events. Our field staff visit production sites routinely, conducting on-site monitoring for air emissions and logging data in Chesapeake's proprietary WellTender mobile application. Key site sensor data is tracked through the app, and if a data input is outside of normal operating and environmental parameters, the app alerts a designated lease operator.

In addition to monitoring, regular maintenance also reduces emissions. We initiate and manage maintenance activities through our Enterprise Asset Management software application. This program allows for the centralized management of equipment and asset data and offers a standardized work order system. Creating such consistency across our operating areas enables increased visibility and accountability for maintenance activities. It also provides data for trend analysis and preventive improvements to our sites.

Innovative Transportation Solutions

For safety and environmental purposes, we utilize pipelines for natural gas, oil and water transportation when possible. These pipelines help promote water reuse and reduce truck traffic and tailpipe emissions.

If pipelines are not available or feasible for economic or logistic reasons, we've developed other innovative solutions to limit trucking and reduce transportation emissions. In the Eagle Ford, Chesapeake designed and implemented central production facilities (CPFs) that use a pipeline-gathering system to bring the production of multiple pads into a single facility. Not only do CPFs reduce surface, wildlife and air impact through reduced equipment counts, they increase equipment reliability and product stream volumes, enabling additional natural gas to be captured and sold.

Flaring

Eliminating routine flaring, the flaring of natural gas at the primary separator during normal operations, is a key step to achieving our goal of net zero GHG emissions by 2035. Chesapeake is committed to finding solutions for its associated gas and venting volumes through innovation, pilot projects and enhanced design and development of our operations.

Flaring Reduction Practices

- Setting sales equipment before a well is ready to produce to minimize or eliminate flaring during start up
- Securing natural gas sales infrastructure or evaluating mobile solutions to prevent emissions
- Using produced gas as on-site fuel and for artificial lift
- Working with gas gathering companies to not flare following an operational upset unless necessary for safety reasons
- Piloting the use of captured surplus gas to power cryptocurrency mining operations
- Capturing emissions through vapor recovery units that direct vapors into a natural gas sales line
- Trialing a new facility design which includes condensate stabilizers reducing tank flaring

Through strategic planning, innovation and partnerships, we'll eliminate routine flaring from wells completed in 2021 and across all operations by 2025.

2021 Routine Flaring Metrics

Metric	2021
Gross annual volume of flared gas (mcf)	293,595
Flaring intensity – gross annual volume of flared gas (mcf)/gross annual production (mcf)	0.01%
Flaring intensity – gross annual volume of flared gas (mcf)/gross annual production (boe)	0.001

In some circumstances, we may need to flare primary gas for safety reasons. These events are not included in our flaring elimination commitment because they're considered non-routine according to the World Bank Group's definition.

Leak Detection and Repair (LDAR)

Oil and natural gas equipment can develop leaks despite regular maintenance and the requirements imposed by state and federal regulations. These leaks can release methane and volatile organic compounds (VOCs) into the atmosphere.

Chesapeake utilizes infrared cameras and regular on-site inspections to identify leaks at our wellsites. Optical Gas Imaging (OGI) cameras allow field technicians to visualize leaks that may not be detected by unaided senses, as well as help pinpoint the source of the leak to direct specific maintenance activities.

While many of our OGI inspectors and staff are certified through the Infrared Training Center, a national organization with thermal imaging expertise, Chesapeake also developed an in-house certification program focused on oil and natural gas operations. Both trainings teach optimal inspection techniques and how to determine root causes of leaks. Chesapeake also requires new inspectors to shadow experienced OGI inspectors to gain field level knowledge and best practices for camera usage.



Most of our OGI inspectors have lease operator experience or other suitable training, giving them the knowledge and authority to repair certain leaks immediately.

LDAR Monitoring Program

Detect	Repair	Record
<ul style="list-style-type: none"> 14 certified inspectors 13 OGI cameras Almost 3,000 inspections conducted in 2021 	<ul style="list-style-type: none"> More than 60% of leaks repaired within one day of detection Leaks are repaired before the regulatory deadline, 2.5 days on average Sites are re-inspected after repair Common leak causes: Loose valves or gaskets that no longer seal properly Leak trend analysis drives preventive maintenance and future inspections 	<ul style="list-style-type: none"> Companywide system schedules inspections and record details for each leak and repair Robust monitoring system allows for compliance assurance
<p>Chesapeake complies with state and federal LDAR regulations, conducting leak detection surveys at the prescribed frequency. This commitment includes inspecting sites within 90 days of a new producing well.</p>		

LDAR Inspection Schedule

Play	Regulatory Requirements	Assigned OGI Inspectors
Eagle Ford Shale	Federal (semiannual) and state (quarterly)	3
Haynesville Shale	Federal (semiannual)	1
Marcellus Shale	Federal (semiannual) and state (quarterly/semiannual/annual)	2

In addition to these regulatory-required inspections, every facility in the Marcellus Shale and Haynesville Shale will receive at least one baseline OGI inspection as a part of our RSG certification.

Across our operations field staff also regularly conduct audio, visual and olfactory (AVO) inspections when visiting wellsites. This combination of regular AVO and OGI inspections provides robust leak detection at our facilities.

Continuous Methane Emissions Technology

We continue to evaluate new technologies, including monitoring equipment in market development, that could improve leak detection capabilities. For example, through our RSG certification efforts, we deployed continuous fixed methane monitors at more than 50% of our production locations in the Haynesville Shale and Marcellus Shale in 2021.

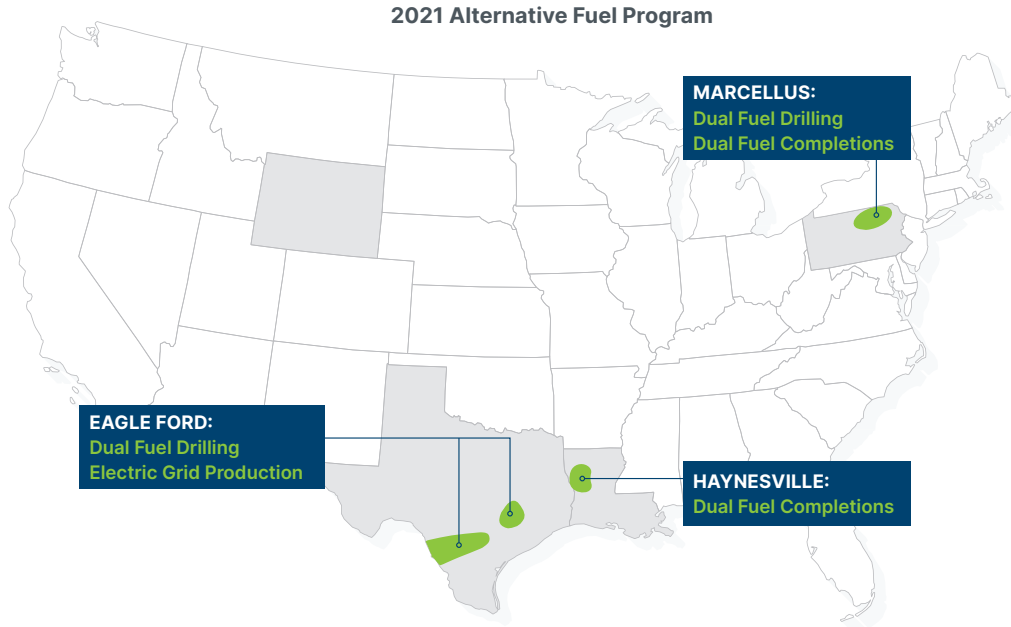
In 2022, we are expanding our continuous monitoring systems to include at least 50% our recently acquired Marcellus assets. Specific to the Eagle Ford, we are piloting numerous methane detection technologies.



In our Haynesville and Marcellus operating areas, we utilize Scientific Aviation’s SMOFIE continuous methane monitoring technology to detect emissions at our production sites. We are currently utilizing more than 800 sensors in the Haynesville and more than 1,200 sensors in the Marcellus.

Alternative Fuels

Operating on diesel-alternative fuels reduces both emissions and waste and provides cost savings for the company. Across Chesapeake-operated areas, we have a number of alternative fuel source capabilities, including electricity for drilling, compressed natural gas to fuel engines and natural gas for dual fuel drilling and completions operations.



In 2021, ~10% of our wells drilled and 42% of wells completed used diesel-alternative fuels. As a result, we reduced our use of diesel fuel for drilling and completions by more than 3.5 million gallons (as compared to 400,000 gallons the year before).

The Environmental Partnership

In 2017, Chesapeake joined [The Environmental Partnership](#), a coalition of nearly 90 U.S. oil and natural gas companies working together to improve the industry’s environmental performance through collaboration and knowledge sharing.

The partnership has focused on reducing emissions as a primary industry goal and established six separate Environmental Performance Programs for participating companies to phase into their operations. We support these programs and their goal of reducing emissions through the adoption of cost-effective technologies.

The Environmental Partnership Emissions Reduction Programs

<p>Pneumatic Controller Program</p> <p>Replace, remove or retrofit high-bleed pneumatic controllers</p>	<p>Manual Liquids Unloading Program</p> <p>Minimize emissions during removal of liquids</p>	<p>Leak Detection/Repair Program</p> <p>Timely repair of leaking equipment</p>
<p>Compressor Program</p> <p>Implement various compressor emission reduction practices</p>	<p>Pipeline Blowdown Program</p> <p>Reduce emissions during pipeline blowdowns</p>	<p>Flare Management Program</p> <p>Reduce domestic high pressure flaring of associated gas</p>