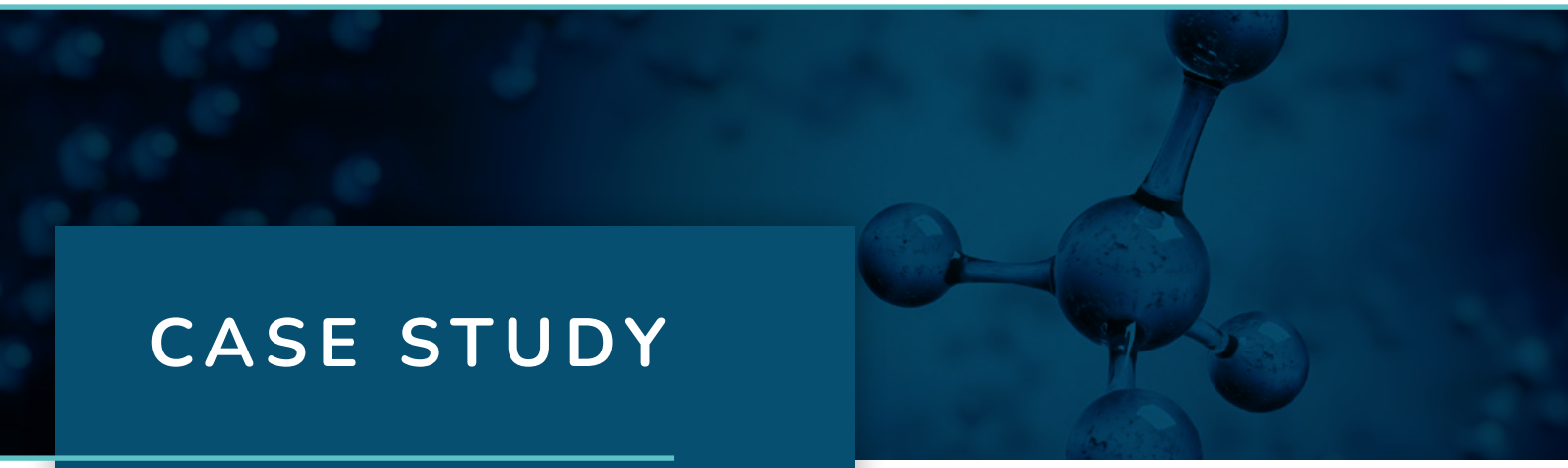
METHANE GUIDING PRINCIPLES

Chevron



CASE STUDY

Chevron: Managing methane in shale and tight assets in the United States

Unconventional oil and gas resources account for most the United States' hydrocarbon production. These operations often cover a wide area and pose particular challenges for methane mitigation. This case study discusses how Chevron implemented measures to reduce methane emissions in unconventional production by minimizing designed flaring and venting in operations, and piloting advanced methane detection approaches.

Context

In 2021, shale and tight resources represented 79% of natural gas and 65% of crude oil production in the United States. Many shale and tight basins are spread-out over a wide geographic footprint. For example, the Permian Basin is about 250 miles wide and 300 miles long, spanning parts of west Texas and southern New Mexico, where Chevron currently holds approximately 2.2 million net acres. Thus, effective methane mitigation solutions deployed across shale and tight operations must be able to reasonably scale across many sites and a large, dispersed geographic region.

In 2020, Chevron's production-sector methane intensity in the United States onshore was 85% lower than the national average, based on data from the U.S. Greenhouse Gas Reporting Program. This was accomplished by minimizing flaring and venting in operations, beyond regulatory requirements and piloting advanced methane detection technology approaches to support more efficient identification and repair of leaks.

Minimizing designed flaring and venting in operations

The United States has federal, state, and local requirements for the use of control technologies that reduce methane and volatile organic compounds, which are co-emitted in upstream oil and gas operations. While Chevron designs facilities to comply with these regulations, it has also looked for opportunities to cost-effectively reduce methane emissions beyond these requirements through early incorporation of control technologies into standard facility designs. Examples include:

- Pneumatic Controllers – Compressed gases are used to drive control actions (e.g., to move valves) across many industries. Due to the dispersed nature of the oil and gas industry, many operators have used the motive force of natural gas for such control actions, after which it is vented to the atmosphere. Emission reduction activities have included utilizing compressed air instead of natural gas in standard facility designs and proactively removed high bleed pneumatic controllers.
- Flaring of Associated Gas - Many oil operations co-produce natural gas, which is called associated gas. In shale and tight assets in the United States, Chevron has prioritized infrastructure planning to provide takeaway capacity for associated gas and has built and operated high-pressure gathering compression systems to ensure high system reliability. More detailed information is available in this report.
- Tanks – Central tank batteries (CTB) reduce the total number of tanks needed in a development area. Chevron's standard CTB and compressor station designs have included vapor recovery units, which enable the sale or beneficial on-site use of captured methane volumes.
- Reduced Emissions Completions– After hydraulically fracturing a well, fluids flow back to the surface and can have small amounts of entrained natural gas. In shale and tight assets, Chevron directs flowback fluids to permanent facilities with vapor recovery units, which capture the gas and reduce methane emissions.

Piloting advanced methane detection approaches

The use of methane detection technologies is complementary to the installation of control technologies that reduce methane emissions associated with flaring and venting. When part of a leak detection and repair (LDAR) program, methane detection technologies help to make sure facilities are operating as designed and to identify opportunities for further emission reductions.

Regulations in the U.S. are often centered around optical gas imaging and EPA Method 21. Both techniques are manual approaches that screen on a component-by-component basis. Since 2016, Chevron has piloted eight advanced methane detection solutions in shale and tight assets - including aircraft, drone, and continuous monitoring - to understand how they might be integrated with current LDAR programs and operations.

Based on results from these pilots, Chevron's operations have increasingly partnered with other operators in the same regions to deploy an aerial LiDAR technology as a voluntary supplement to traditional LDAR programs. This technology was selected due to the combination of detection limits, plume location information/ imaging, and screening speed, which support the needs of geographically spread-out shale and tight operations.

For more information on monitoring technologies, see the case studies in Monitoring Pathways or the resources outlined in Monitoring and managing methane emissions.

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