

March 2018

Wyoming Natural Gas Waste Report

Wyoming Outdoor Council



These blue skies in Wyoming's Upper Green River Basin are protected thanks to "leak detection and repair" (LDAR) protocols that were successfully implemented in the Pinedale Anticline gas field. Yet the state has failed to implement LDAR requirements statewide, resulting in large volumes of wasted gas and millions of dollars in lost tax revenue. (Photo: Dustin Bleizeffer)

Wyoming loses an estimated annual \$51 million to \$96 million worth of natural gas due to intentional flaring and venting, and careless leaks.¹ That's an annual \$8.8 million to \$16.1 million in lost revenue to Wyoming taxpayers.

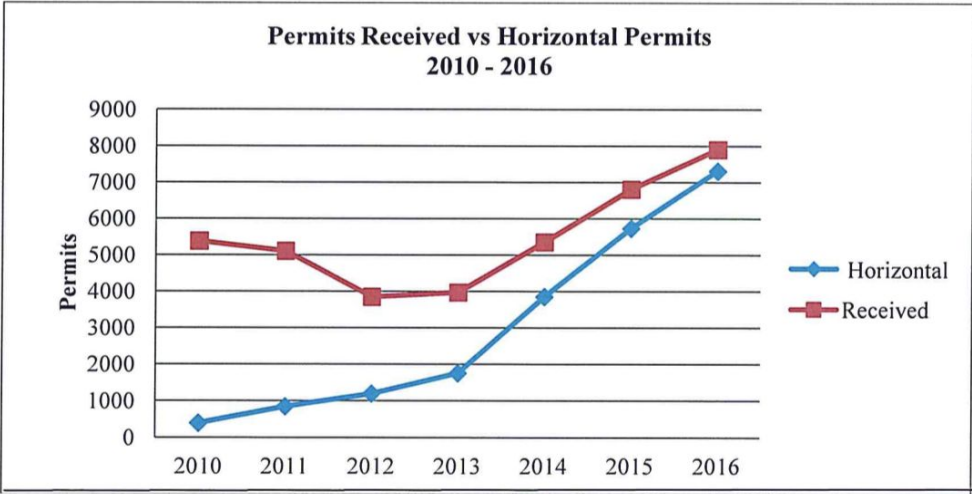
Not every bit of the wasted natural gas can be feasibly captured. But an analysis by the Wyoming Outdoor Council and the Environmental Defense Fund shows that the state could improve its oversight and accountability, resulting in less wasted gas, fewer harmful emissions, and more revenue from this finite resource.

The potential tax revenue increase from capturing more of this wasted gas is substantial, and could help Wyoming and local communities meet needs for education, roads and bridges, and allow companies to create Wyoming jobs of the future in clean, efficient energy production.

¹ These figures were based upon 2015 volumes and a range of current and historical average prices (current \$2.98/Mcf price and a reference \$4/Mcf).

Lost Value	Low Range <i>(Low Price, Low Volume)</i>	High Range <i>(High Price, High Volume)</i>
Severance Tax	\$3.7 million	\$5.8 million
Ad Valorem	\$3.4 million	\$6.5 million
State Royalties	\$664,000	\$1.6 million
Federal Royalties (state share)	\$1.1 million	\$2.2 million
Total Lost Tax & Royalties	\$8.8 million	\$16.1 million

Importantly, the estimated annual revenue loss of \$8.8 million to \$16.1 million is based on state data from 2015, a relatively low production and low price year for oil and natural gas. Industry and state agencies are preparing for a massive increase in production, with a record 10,000 new applications for permit to drill now before the Wyoming Oil and Gas Conservation Commission.



(SOURCE: Wyoming Oil and Gas Conservation Commission)

Both production volume and price factor in tax revenue from oil and gas, and that means tax revenue losses due to wasted gas will only increase if Wyoming doesn't act now. Major oil and gas projects such as the 5,000-well Converse County Oil & Gas and the 1,500-well Greater Crossbow fields may be approved for drilling as soon as 2019. Currently, those projects require no industry best practices to reduce venting and flaring, or to regularly monitor for leaks.

Yet in the Upper Green River Basin, Wyoming has been a leader in requiring methods to detect and capture more of our lost natural gas. The state can, and should, do more on a statewide basis. And if the range of estimated revenue losses seems unduly wide that is because the state does a poor job of tracking wasted gas and the related lost tax revenue. These are critical revenue streams that taxpayers and

budget-strapped communities deserve to see and understand. Wyoming should calculate lost revenues through venting, flaring and leaks and make this information public.

The state should also continue to support the reduction of the amount of gas that is allowed to be lost or wasted through venting, leaks and flaring. The state can implement statewide requirements for what is called Leak Detection and Repair (LDAR) — a proven, low-cost strategy that could significantly reduce the oil and gas industry’s pollution by simply finding and plugging these leaks. By finding and fixing these leaks promptly, the state will also reduce emissions that lead to unhealthy smog — pollution that is directly linked to asthma and can increase cancer risk.

HOW IS GAS WASTED?

Intentional venting and flaring (burning off) of natural gas, which contains methane and various forms of volatile organic compounds, is part of normal operations in the production of oil and gas. Sometimes flaring is done for the safety of workers, but it’s primarily done to avoid the cost of collection and transportation of the hydrocarbons that are residual, or secondary, to the primary target — the oil that’s currently fetching the higher price on the market.

Segment	Emissions (MT CH4)	Emissions (Mcf CH4)	Wasted Gas (Mcf NG)
Production: Emissions	180,000	9,200,000	12,000,000
Production: Vented and flared gas	---	---	5,200,000
Total Production	180,000	9,200,000	17,000,000
Gathering & Boosting	110,000	5,600,000	7,100,000
All Processing	62,000	3,200,000	3,600,000
Transmission & Storage	39,000	2,000,000	2,200,000
Total	391,000	20,000,000	29,900,000

Fugitive hydrocarbon emissions are unplanned releases from equipment leaks or malfunctioning equipment. Fugitive emissions can escape from all parts of the oil and gas production infrastructure, from connections between pipes and vessels, to valves and equipment, oil storage tanks, natural gas condensate, and produced water pits.

Since 2015, the Wyoming Oil and Gas Conservation Commission has collected self-reported data from oil and gas operators regarding the estimated volumes of gas vented and flared. The Wyoming Department of Environmental Quality began in the same time period to require producers in the Jonah and Pinedale Anticline gas fields to implement a suite of emissions reduction methods, including quarterly LDAR

inspections on new and existing wells. However, analysis by the Wyoming Outdoor Council and the Environmental Defense Fund shows that significantly more gas could be captured if these measures were implemented statewide without placing insurmountable costs on operators.



Infrared cameras can help detect gas leaks from production facilities such as this one located near Casper, Wyoming. (Photos: Environmental Defense Fund)

WHY WE SHOULD CARE

Cutting waste puts more gas into the production system, which means greater volumes and sales for the operator, and increased revenue to taxpayers. The estimated annual value for gas lost to venting, flaring and leaks is \$51 million to \$96 million — so there's a strong financial incentive to minimize this waste.

Wyoming, which is currently dealing with major budget cuts, desperately needs the estimated \$8.8 million to \$16.1 million in lost revenue. Of that, the annual \$3.4 million to \$6.5 million in lost ad valorem revenue (property tax that goes directly to counties) could have gone to the purchase of emergency equipment, or road and bridge repair, or human services like public health nurses and libraries.

The top five counties missing out on the most ad valorem dollars associated with wasted gas were Converse, Goshen, Campbell, Laramie and Sweetwater. The total lost in ad valorem for those counties in 2015 was \$2.8 million with an average of \$560,000 per county.

With this money, each of these counties could have purchased a fire rescue truck, an ambulance, an additional health nurse, covered their mental health services costs and covered a great deal of road and bridge repair.

WHAT ARE WE ASKING?

We are asking the Wyoming Department of Environmental Quality's Air Quality Division to extend LDAR protocols for new facilities statewide, building on the success of its program from the Jonah and Pinedale Anticline gas fields in the western part of the state. But those two gas fields are the only place in the state where Wyoming DEQ requires LDAR protocols. It should also implement a full menu of waste-reducing methods and protocols for all existing wells statewide.

LDAR is a protocol that requires companies to regularly inspect their oil and gas wells and associated equipment using special tools such as cameras that can detect leaks from equipment so that repairs can be made quickly and more effectively. The Environmental Protection Agency issued [regulations](#) in 2016 requiring all new oil and gas facilities have LDAR protocols. The Bureau of Land Management issued similar requirements that year for both new and existing wells on federal and tribal lands.

However, these federal regulations are tied up in court battles, and subject to rollbacks from the Trump administration. The BLM, in its own analysis, says rolling back the LDAR protocols means more wasted gas and less production. Whether these federal requirements remain is uncertain, so it is critical that the state live up to its own responsibilities to protect its own air and its taxpayers.

Far from adding a burdensome layer of regulation, some oil and gas leaders, such as Jonah Energy right here in Wyoming, are [voluntarily taking on LDAR protocols](#), above and beyond what the state requires for its field, for its cost savings. The savings are substantial, given the tens of millions of dollars in natural gas still being wasted among all operators in Wyoming.

Industry operators who use LDAR find that the savings in the recapture of gas often pay for and/or exceeds the cost of implementing these protocols. This creates a win-win-win situation for public health, state and county coffers, and the operator.

Wyoming has the necessary experience and authority to enforce these protocols, and it understands the proven success in reducing harmful emissions. Wyoming counties and towns desperately need the millions of dollars that would be earned from otherwise wasted gas.

SOURCES AND METHODOLOGY

The inventory is based upon a custom analysis combining several data sources including recent studies, the Environmental Protection Agency Greenhouse Gas Reporting Program (GHGRP)¹, and the EPA National Greenhouse Gas Inventory (GHGI)². Individual source emissions were estimated using the following data sources and methods:

1. Associated gas venting and flaring – GHGRP onshore production emissions adjusted for non-reporters and scaled from basin to state level using well counts and production data.
2. Compressors – GHGRP onshore production emissions adjusted for non-reporters and scaled from basin to state level using well counts and production data.
3. Dehydrators – GHGRP onshore production emissions adjusted for non-reporters and scaled from basin to state level using well counts and production data.
4. Flares – GHGRP onshore production emissions adjusted for non-reporters and scaled from basin to state level using well counts and production data.
5. Hydrocarbon tank flashing – GHGRP onshore production emissions adjusted for non-reporters and scaled from basin to state level using well counts and production data.
6. Liquids unloading – GHGRP onshore production emissions adjusted for non-reporters and scaled from basin to state level using well counts and production data.
7. Completions, workovers, and well testing – GHGRP onshore production emissions adjusted for non-reporters and scaled from basin to state level using well counts and production data.

-
8. Pneumatic controllers – Adjusted GHGRP activity data; emission factors (Allen et al., p. 3) for operational and malfunctioning low-bleed, high-bleed, and intermittent-bleed devices.
 9. Pneumatic pumps – Adjusted GHGRP activity data; emission factors (Allen et al., p. 4) for pneumatic pumps.
 10. Combustion exhaust – Adjusted GHGRP CO₂ emissions; emission factors (EPA AP-425).
 11. Produced water tank flashing – Drilling information water production; emission factors (EPA O&G Tool.6).
 12. Equipment leaks – Production site counts and emission factors (Allen et al., p. 4); based on approach of Zavala-Araiza et al., (p. 7).
 13. Production abnormal conditions – Several studies have found that a phenomenon sometimes known as “super emitters” – malfunctioning equipment at a variety of oil and gas sites that cause abnormally high emission rates – are responsible for a significant portion of industry’s methane pollution. For example, Zavala-Araiza, et al., (p. 7) found that empirically-based site-level emissions of Barnett Shale well pads were 50% higher than modeled component-level estimates. These excess emissions were attributed to abnormal process conditions that are the likely cause of many sites with unintentionally high emissions. These emissions typically are excluded from inventories. For example, malfunctioning tank controls can cause a site to have much higher emissions than would be estimated if controls are assumed to be operating properly.

For this inventory, we do NOT adjust our emission estimates to account for super-emitters in order to be conservatively low. However, a 2017 study found that well pads in Wyoming had a relatively low loss rate but the second highest absolute emission rate in the study (Robertson, et al).² Basin-level and site-level data from Wyoming support that O&G emissions are substantially higher than inventory estimates (Robertson, et al., p. 8-9).



² <http://pubs.acs.org/doi/abs/10.1021/acs.est.7b00571>