



July 2016

OIL AND GAS

Interior Could Do More to Account for and Manage Natural Gas Emissions

Accessible Version

GAO Highlights

Highlights of [GAO-16-607](#), a report to congressional requesters

Why GAO Did This Study

Interior's BLM oversees and accounts for onshore oil and gas production on federal lands. Interior generally collects royalties for this oil and gas, but its guidance, which was issued over 30 years ago, may exempt gas that is vented, flared, or used to operate equipment on the lease. Increased oil production in recent years has resulted in a rise in flared gas in certain regions where there is limited infrastructure to transport or process gas associated with oil production. BLM has proposed updating its venting and flaring regulations to clarify how such emissions are to be managed.

GAO was asked to review Interior's management of natural gas emissions onshore. This report examines (1) the extent to which Interior can account for these emissions and (2) how BLM field offices have managed requests to vent or flare. GAO analyzed Interior data, including a simple random sample of venting or flaring requests from fiscal year 2014, the most recent year for which data were available; reviewed Interior documents; and interviewed officials from a nongeneralizable sample of six BLM field offices selected based on increased natural gas emissions in recent years. GAO also interviewed operators with leases managed by two BLM field offices.

What GAO Recommends

GAO is making four recommendations to Interior, including providing additional guidance on how operators are to report natural gas emissions. Interior generally concurred with these recommendations.

View [GAO-16-607](#). For more information, contact Frank Rusco at (202) 512-3841 or ruscof@gao.gov.

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What GAO Found

The Department of the Interior's (Interior) guidance to oil and gas operators on its reporting requirements has limitations that may hinder the extent to which it can account for natural gas emissions on onshore federal lands (leases). Interior is required to ensure that oil and gas operations are conducted in a manner that minimizes waste. As part of its oversight activities, Interior requires operators to submit monthly Oil and Gas Operations Reports (OGOR). Interior uses these reports to track volumes of oil and gas produced on federal lands, including gas that may be exempt from royalties, such as gas released into the air (vented), burned (flared), or used to power equipment on the lease (lease use). Historically, Interior's focus has been on collecting data from royalty-bearing oil and gas production, and thus it has provided limited guidance on how operators are to report natural gas emissions. For example, Interior

- does not provide specific instructions on how to estimate natural gas emissions, which results in operators using varying estimation methods that may be difficult to verify;
- provides limited guidance on which OGOR categories to use when reporting flared gas emissions, which results in inconsistent reporting; and
- does not specify which natural gas emissions activities should be reported, resulting in operators not reporting some emissions (e.g., from storage tanks).

As a result of these limitations, Interior may not have a consistent accounting of natural gas emissions from onshore federal leases, and does not have the information it needs to reasonably ensure it is minimizing waste on these leases.

The Bureau of Land Management's (BLM) field offices have not consistently followed BLM's existing guidance in managing operators' venting or flaring requests. GAO found that BLM field offices have approved venting or flaring requests that did not include the documentation BLM's guidance requires. Specifically, in fiscal year 2014, GAO found that BLM received 1,281 venting or flaring requests from operators. GAO reviewed the documentation for a random sample of 100 of those requests and, based on this sample, estimates that 90 percent (+/-8) of the requests to BLM did not provide the documentation required by BLM guidance. GAO also estimates that BLM approved 70 percent (+/-9) of these venting or flaring requests and, for nearly half of the approvals, allowed operators to flare gas royalty-free. Further, GAO found that selected BLM field offices have applied BLM guidance differently to venting or flaring requests. For example, officials in two BLM field offices GAO reviewed said they used their authority under the existing guidance to charge royalties on flared gas, while a third field office was considering doing so. The other three field offices GAO reviewed have interpreted BLM guidance as allowing all venting or flaring requests in their regions to be approved royalty-free. BLM's proposed update to its regulations, if finalized, would clarify how BLM will manage future venting or flaring requests. Interior officials told GAO that they expect to finalize the proposed update to its regulations by the end of calendar year 2016 and that finalizing the regulations is an Administration priority.

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Abbreviations

BLM	Bureau of Land Management
EPA	Environmental Protection Agency
Interior	Department of the Interior
NTL-4A	Notice to Lessees and Operators of Onshore Federal and Indian Oil and Gas Leases
OGOR	Oil and Gas Operations Report
ONRR	Office of Natural Resources Revenue

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July 7, 2016

The Honorable Alan Lowenthal
Ranking Member
Subcommittee on Energy and Mineral Resources
Committee on Natural Resources
House of Representatives

The Honorable Diana DeGette
Ranking Member
Subcommittee on Oversight and Investigations
Committee on Energy and Commerce
House of Representatives

The Honorable Peter A. DeFazio
House of Representatives

In fiscal year 2015, oil and gas companies produced more than 3.3 trillion cubic feet of natural gas and more than 171 million barrels of oil from onshore oil and gas leases on federal lands managed by the Department of the Interior's (Interior) Bureau of Land Management (BLM), according to data provided by Interior. BLM is responsible for managing and accounting for approximately 700 million subsurface onshore acres and production from nearly 100,000 federal onshore oil and gas wells. According to Interior, production from these wells accounts for 11 percent of the nation's natural gas supply and 5 percent of its oil supply. Under the Minerals Leasing Act of 1920, BLM is required to ensure that firms producing oil and gas use all reasonable precautions to prevent waste of oil or gas developed on these lands.¹ The act also authorizes Interior to collect royalties on oil and gas produced on federal lands.² Interior's Office of Natural Resources Revenue (ONRR) collects these royalties, which its data show totaled nearly \$2.2 billion in fiscal year 2015.

¹30 U.S.C. § 225.

²30 U.S.C. §§ 226(b)(1)(A) and (c)(1); 30 U.S.C. § 352.

Interior requires monthly Oil and Gas Operations Reports (OGOR) from oil and gas companies (operators), which track and account for volumes of oil and gas produced on all federal lands. While most of the natural gas produced on leased federal lands and waters is sold, some is lost during production for various reasons, including leaks and releases for ongoing operational or safety procedures. This natural gas is either released directly into the atmosphere (vented) or burned (flared).³ In addition to gas that is lost during production, some natural gas may be used to operate equipment on the lease (lease use). When we refer to vented, flared, and lease use gas collectively, we use the term natural gas emissions. Until recently, Interior has generally exempted operators from paying royalties on reported natural gas emissions.

Natural gas emissions, as estimated by Interior and other sources, make up a relatively small but uncertain percentage of total natural gas production on public lands. However, flaring has generally increased in recent years as technological advances, such as horizontal drilling and hydraulic fracturing in shale formations,⁴ have led to the rapid development of oil and gas resources. These resources are often in remote areas where the infrastructure to transport or process the gas associated with oil deposits has not kept pace with rapid increases in oil production.⁵ Interior data show a substantial increase in flaring in recent years in New Mexico and North Dakota.

³For the purposes of this report, we use “natural gas” to mean the mixture of gas resulting from oil and gas production activities. This natural gas will vary in content but, on average, is approximately 80 percent methane, with the remaining 20 percent a mix of other hydrocarbons and nonhydrocarbons, such as carbon dioxide and nitrogen.

⁴Shale is a sedimentary rock that is predominantly composed of consolidated clay-sized particles. Hydraulic fracturing (also known as hydrofracking, fracking, or fracing) is commonly defined as an oil or gas well completion process that directs pressurized fluids typically containing any combination of water, proppant, and any added chemicals to penetrate tight rock formations, such as shale or coal formations, in order to stimulate the oil or gas residing in the formation, and that subsequently requires high-rate, extended flowback to expel fracture fluids and solids.

⁵Although most natural gas production involves extracting gas from wells drilled into underground gas reservoirs, some natural gas is generated as a by-product of oil production. Gas produced during oil production is called associated natural gas.

In an October 2010 report, we found that natural gas emissions have both economic and environmental implications.⁶ On federal oil and gas leases, natural gas that is vented, flared, or used on the lease instead of captured for sale represents a loss of royalty revenue for the federal government. For example, in our October 2010 report, we found that the Environmental Protection Agency's (EPA) estimate of 126 billion cubic feet of natural gas vented or flared from onshore federal leases in 2008 represented approximately \$58 million in federal royalty payments.⁷

Vented, flared, and lease use gas are also sources of greenhouse gas emissions—primarily methane and carbon dioxide.⁸ Natural gas consists primarily of methane, and methane (released through venting) is 34 times more potent by weight than carbon dioxide (released through flaring) in its ability to warm the atmosphere over a 100-year period, and 86 times more potent over a 20-year period, according to the Intergovernmental Panel on Climate Change.⁹ Overall, EPA has found that oil and natural gas systems are the nation's second largest stationary source of greenhouse gases—accounting for 236 million metric tons of carbon dioxide equivalent in 2014.¹⁰

⁶GAO, *Federal Oil and Gas Leases: Opportunities Exist to Capture Vented and Flared Natural Gas, Which Would Increase Royalty Payments and Reduce Greenhouse Gases*, [GAO-11-34](#) (Washington, D.C.: Oct. 29, 2010).

⁷[GAO-11-34](#).

⁸While venting releases methane and flaring releases carbon dioxide, lease use gas may release either methane or carbon dioxide. For example, gas that is used on lease to run generators or heaters releases carbon dioxide, and gas that is vented through use of pneumatic devices, such as pumps or valves, on lease releases methane.

⁹The Intergovernmental Panel on Climate Change, established by the United Nations Environment Programme and the World Meteorological Organization, assesses climate change to provide a scientific view on the current state of climate change and its potential environmental and socio-economic consequences. Myhre, G., D. Shindell, F.-M. Bréon, W. Collins, J. Fuglestedt, J. Huang, D. Koch, J.-F. Lamarque, D. Lee, B. Mendoza, T. Nakajima, A. Robock, G. Stephens, T. Takemura and H. Zhang, 2013: Anthropogenic and Natural Radiative Forcing. In: *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

¹⁰EPA's Greenhouse Gas Reporting Program.

According to Interior officials, BLM has been updating its regulations on natural gas emissions for a number of years, but it can take years to propose and finalize such regulations. On January 22, 2016, BLM announced its proposed methane and waste reduction regulations that would update its existing guidance on venting, flaring, and lease use gas.¹¹ Among other things, the proposed regulations would clarify when gas lost through venting, flaring, or leaks is subject to royalties, and when oil and gas used on site would be royalty-free. Interior officials we interviewed told us that BLM plans to finalize these regulations by the end of calendar year 2016. BLM's proposed regulations are part of an interagency effort known as the President's Climate Action Plan's Strategy to Reduce Methane Emissions—which sets a goal to cut methane emissions from the oil and gas sector by 40 to 45 percent from 2012 levels by 2025 and calls upon BLM to “lead by example” on public lands. Some state agencies—such as air quality and oil conservation offices—have also taken actions that have addressed natural gas emissions, including those from oil and gas produced on leased federal land within those states.

In light of these actions, you asked us to review Interior's management of natural gas emissions on onshore federal oil and gas leases. This report examines (1) the extent to which Interior can account for natural gas emissions from onshore federal leases and (2) how selected BLM field offices have managed requests to vent or flare natural gas on onshore leases.

To conduct this work, we interviewed Interior officials and operators about reported natural gas emissions and factors that affect how Interior accounts for them.¹² We also reviewed BLM regulations and documents and interviewed officials from six BLM field offices in Carlsbad, New Mexico; Casper, Wyoming; Dickinson, North Dakota; Farmington, New Mexico; Miles City, Montana; and Vernal, Utah. We selected these six offices based on the high volumes of natural gas that are vented, flared,

¹¹*Waste Prevention, Production Subject to Royalties, and Resource Conservation*, 81 Fed. Reg. 6616 (2016) (to be codified at new 43 C.F.R. subparts 3178 and 3179) (proposed Jan. 22, 2016).

¹²For comparison purposes, we also reviewed and discussed with EPA officials how they collect national emissions data from operators for EPA's national greenhouse gas inventory and other EPA databases.

and used on leases managed by these offices and their overall oil and gas production volumes. We also reviewed BLM's proposed new regulations that were announced in January 2016.¹³

In addition, we interviewed oil and gas and air quality regulatory officials from five states with high natural gas production—Colorado, New Mexico, North Dakota, Utah, and Wyoming—on actions these states have taken to address natural gas emissions from oil and gas leases in these states (see app. I). Because these six BLM field offices and five states were nonprobability samples, our findings cannot be generalized to other BLM field offices or states, but they can provide insights into oil and gas operations for key producing regions in the United States. In addition, we analyzed a simple random sample of 100 of the 1,281 fiscal year 2014 venting or flaring requests to assess the extent to which field office supervisors approved these and followed BLM's guidance for doing so. These findings can be generalized to all BLM field offices.¹⁴ To assess the reliability of BLM's venting and flaring request data, we compared our data set with other published data and interviewed knowledgeable agency officials, including officials in the field responsible for data entry. We found these data sufficiently reliable for assessing BLM field office compliance with BLM's venting and flaring guidance.

We conducted this performance audit from January 2015 to July 2016 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

This section provides an overview of (1) the oil and gas production process and release of natural gas emissions, (2) the recent oil

¹³*Waste Prevention, Production Subject to Royalties, and Resource Conservation*, 81 Fed. Reg. 6616 (2016) (to be codified at new 43 C.F.R. subparts 3178 and 3179) (proposed Jan. 22, 2016).

¹⁴Estimates based on a probability sample are subject to sampling error. Fiscal year 2014 was the most recent year for which data were considered complete by BLM at the time of our review. See app. II for more information about our objectives, scope, and methodology.

production boom and associated natural gas, and (3) Interior’s reporting requirements on natural gas emissions.

The Oil and Gas Production Process and Release of Natural Gas Emissions

The oil and gas production process on federal leases involves several stages, including the drilling, development, and initial production of these hydrocarbons along with routine operation and maintenance activities throughout the life of a field. Throughout these stages, operators typically vent or flare some natural gas, often intermittently (see fig. 1).¹⁵ Venting is the direct release of natural gas into the atmosphere, and flaring is the release of natural gas to a flare stack where it can be safely combusted. Although gas may be vented or flared throughout these stages, where feasible, flaring is generally preferable to venting because it can prevent accidental fires or explosions and it reduces the climate impact of oil and gas production.¹⁶ Leaks, or “fugitive” emissions, may occur at any stage of the production process.

Figure 1: Illustrative Example of Onshore Production and Associated Sources of Vented or Flared Gas



Drilling - Well completions

During the drilling phase, operators need to clear wells of mud and debris to transform a drilled well into a producing well, and they may vent or flare gas during this process.

Production - Associated gas from oil wells

Operators may need to flare associated natural gas if the well is not connected to a gathering line, or if there is not sufficient capacity in existing gas gathering infrastructure.

Operations - Pneumatic valves

Pneumatic valves open or close to maintain liquid level, pressure, or temperature and are often powered by pressurized natural gas. A small amount of gas is vented each time the valve opens or closes.

Storage - Crude oil storage tanks

When crude oil is transferred to storage tanks, the gas dissolved in the crude oil may vaporize and collect in the space between tank liquids and the top of the tank. Operators may vent or flare these vapors.

Source: GAO. | GAO-16-607

¹⁵For purposes of this report, we examine venting and flaring during the production process only.

¹⁶This is because the combustion process converts methane, primarily a component of natural gas, into carbon dioxide and water vapor.

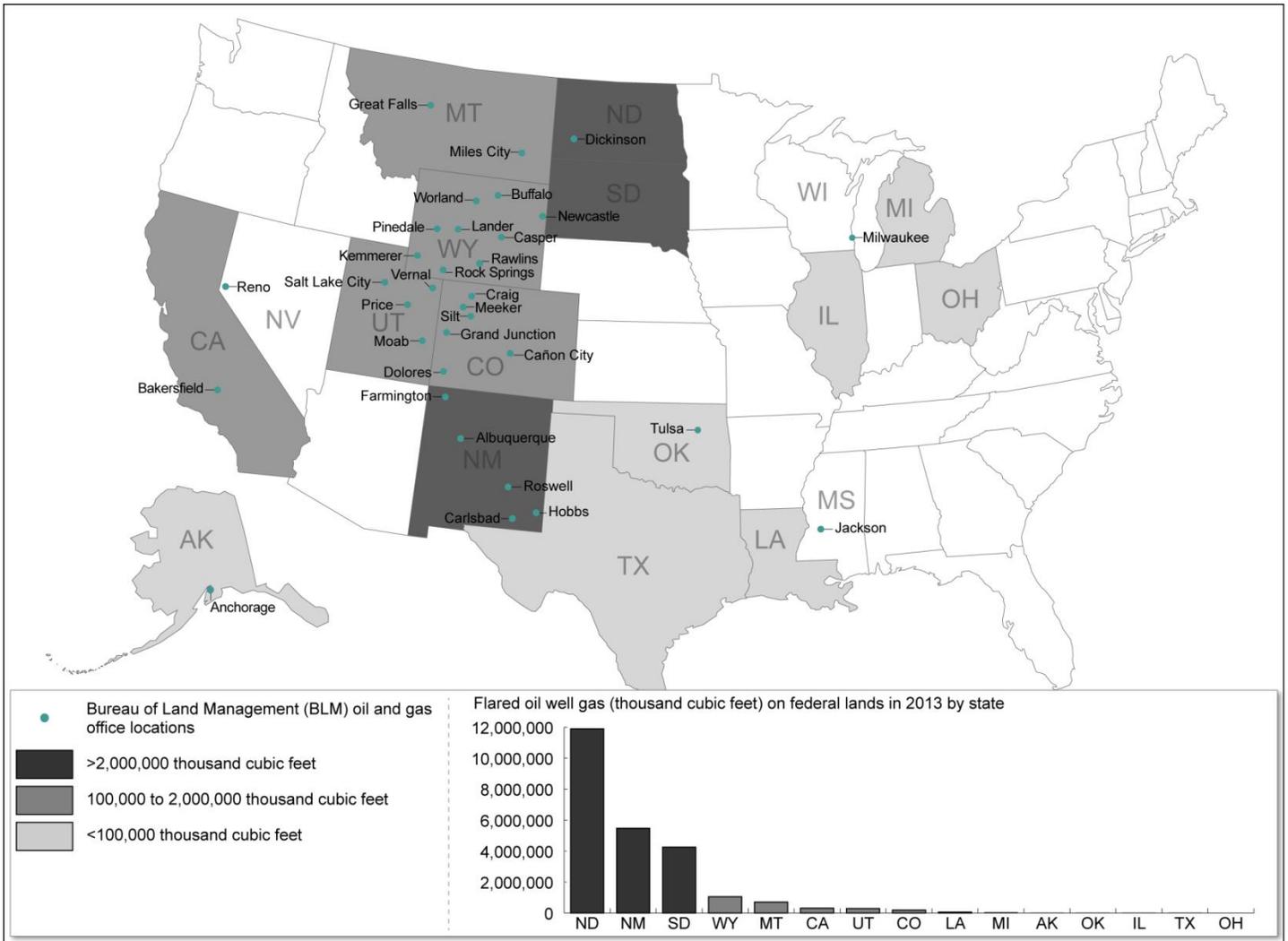
The Recent Oil Production Boom and Associated Natural Gas

The combination of advances in horizontal drilling techniques and hydraulic fracturing along with relatively high oil prices in the past few years have allowed the development of oil and natural gas from unconventional reservoirs, such as shale formations that were previously uneconomical to develop, and have led to historically high production levels. In a September 2012 report, we found that from 2007 to 2011 shale oil production increased more than fivefold, and shale gas production increased more than fourfold—driving increases in U.S. oil and gas production.¹⁷ Oil and natural gas are often found together in the same reservoir but may vary in relative amounts. In areas where the primary purpose of drilling is to produce oil, operators may flare associated natural gas because no local market exists for the gas and transporting it to a distant market may not be economically feasible. For onshore oil and gas production on federal lands, rapid development occurred in states such as New Mexico and North Dakota, and the bulk of the flaring took place in areas overseen by a handful of BLM offices in those two states. As shown in figure 2, of the 33 BLM field offices that manage oil and gas production, most of the flaring reported on federal lands that occurred in calendar year 2013 occurred in North Dakota, New Mexico, and South Dakota, managed primarily by BLM field offices in Carlsbad, New Mexico, and Dickinson, North Dakota.¹⁸

¹⁷GAO, *Oil and Gas: Information on Shale Resources, Development, and Environmental and Public Health Risks*, [GAO-12-732](#) (Washington, D.C.: Sept. 5, 2012).

¹⁸As discussed above, according to Interior, only 11 percent of natural gas and 5 percent of oil is produced on onshore federal lands.

Figure 2: Volumes of Flared Natural Gas from Oil Wells on Federal Lands in 2013



Sources: GAO analysis of BLM data; Map Resources (map). | GAO-16-607

Interior's Reporting Requirements on Natural Gas Emissions

Several federal regulations apply to Interior's management of natural gas emissions and operators' responsibilities to report these emissions.

First, federal regulations require an authorizing officer at Interior to oversee and enforce regulations related to the development of and operations on federal oil and gas leases (see fig. 3).¹⁹ Authorizing officers or “supervisors” are typically BLM field office officials who approve venting or flaring requests. Venting, flaring, and other royalty-free uses of oil and natural gas on BLM-administered leases are currently governed by BLM guidance known as Notice to Lessees and Operators of Onshore Federal and Indian Oil and Gas Leases (NTL-4A), which the U.S. Geological Survey issued in 1979, before BLM assumed oversight responsibility for onshore oil and gas development and production.²⁰ NTL-4A generally prohibits venting or flaring of gas, but provides for a number of exemptions to this prohibition, both for short-term or emergency venting or flaring and for venting or flaring for longer periods (i.e., long-term), if operators obtain supervisory approval in advance.

Second, federal regulations call for royalties to be computed based on the quantity and quality of produced, unprocessed gas at a measurement point approved by BLM.²¹ Losses of gas (i.e., those from natural gas emissions) are generally not subject to royalties provided that such losses meet BLM requirements. However, BLM field office supervisors apply criteria set in NTL-4A to determine whether approved gas lost through venting or flaring is “unavoidably lost,” and therefore royalty-free, or “avoidably lost,” and therefore subject to royalties. For example, under NTL-4A, venting or flaring gas vapors released from storage tanks or low pressure production vessels is generally considered to be unavoidably lost, and no royalties are due. However, BLM supervisors may determine that vented or flared gas is avoidably lost if (1) the losses are due to negligence on the part of the lessee or operator; (2) the losses are due to the failure of the lessee or operator to take all reasonable measures to prevent or to control the losses; or (3) the losses are due to the failure of the lessee or operator to comply fully with the applicable lease terms and regulations, appropriate provisions of the approved operating plan, or the prior written orders of the supervisor. Generally, operators are to submit venting or flaring requests to a supervisor at their local BLM field office in

¹⁹43 C.F.R. § 3161.2.

²⁰44 Fed. Reg. 76600 (Dec. 27, 1979).

²¹30 C.F.R. § 1206.154.

advance to obtain an approval and determination of whether losses are unavoidable or avoidable.²² BLM field office officials we spoke with told us, however, that because of backlogs in the venting or flaring requests submitted to BLM, operators may sometimes seek and obtain verbal approval to vent or flare, and then later submit a written request once venting or flaring is under way. In addition, NTL-4A provides that no royalty obligation shall accrue on any produced gas that is used on the same lease for beneficial purposes (i.e., lease use). This royalty exception is sometimes referred to as the beneficial use or lease use exception.

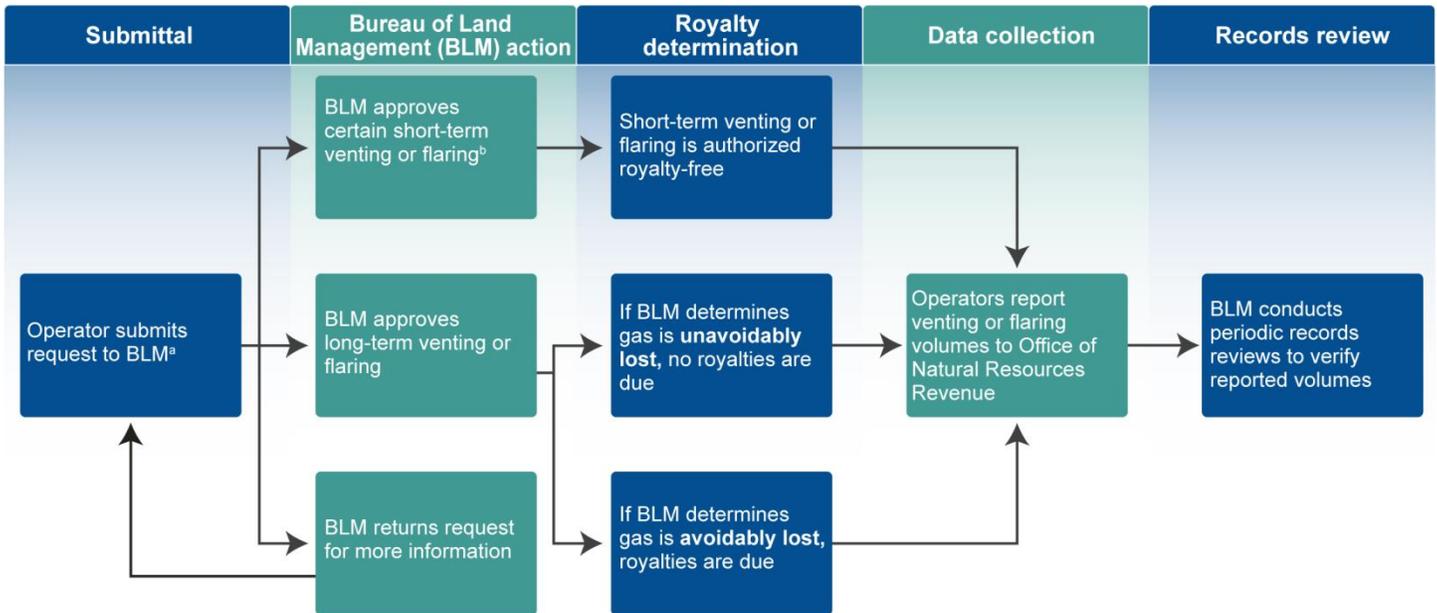
Third, federal regulations require operators to report monthly oil and gas production to Interior on the OGOR.²³ Moreover, NTL-4A provides that the volume of oil or gas produced, whether sold, avoidably or unavoidably lost, vented or flared, or used on lease, must be reported. To assist operators in fulfilling Interior's reporting requirements for oil and gas produced on federal leases, ONRR's Minerals Production Reporter Handbook provides instructions on how to complete the OGOR, including a description of various reporting categories.²⁴ The handbook includes several categories for natural gas emissions that are royalty-free, including categories for vented gas associated with oil wells, vented gas associated with gas wells, flared gas associated with oil wells, flared gas associated with gas wells, lease use gas, gas that is "spilled and/or lost" unavoidably, and gas lost to evaporation or shrinkage. The handbook also includes categories for natural gas emissions that are royalty-bearing, specifically for gas that is spilled and/or lost avoidably.

²²Supervisory approval is not required during the initial production period of up to 30 days or 50 million cubic feet of gas. Lessees are also authorized to vent or flare gas on a short-term basis without incurring a royalty obligation for emergencies and certain well tests, not to exceed 24 hours.

²³30 C.F.R. Part 1210.

²⁴The handbook refers to these categories as disposition codes.

Figure 3: Illustration of the Department of the Interior’s Process for Approving and Collecting Data on Venting or Flaring



Source: GAO analysis of BLM information. | GAO-16-607

^aOther than authorized short-term flaring, which is royalty-free, any volumes that operators vent or flare without BLM approval are subject to royalties.

^bCertain types of short-term flaring, such as routine or special well tests, require BLM approval. Although it is not specifically required by the guidance, operators may also sometimes seek BLM approval to flare in short-term emergency situations.

Interior's Guidance to Operators on Reporting Requirements Has Limitations That May Hinder the Extent to Which It Can Account for Natural Gas Emissions

Interior's limited guidance to operators on how to report natural gas emissions on the OGOR may hinder the extent to which it can account for such emissions. Interior officials told us that their focus has historically been on collecting data on royalty-bearing oil and gas production rather than on natural gas emissions, which until recently have generally been royalty-free. Thus, the guidance Interior has provided to operators on how to report natural gas emissions has not ensured that these data are consistent and complete. Without such data, Interior cannot ensure that operators are minimizing waste on federal oil and gas leases and collecting all royalties that are owed.

We identified several key limitations with Interior's guidance for operators OGOR reporting that may hinder Interior's ability to accurately account for natural gas emissions and potentially collect royalties when appropriate.²⁵ First, Interior's guidance does not provide specific instructions on how to estimate natural gas emissions on the OGOR. Second, Interior provides limited guidance on which OGOR reporting categories operators are to use to report flared volumes. Third, Interior's guidance does not specify which activities are to be reported under OGOR categories for natural gas emissions. In addition, Interior does not require operators to differentiate between types of lease use volumes reported on the OGOR, which, going forward, could help Interior track progress toward its new goals for methane reduction. If finalized, BLM's recently proposed methane and waste reduction regulations could clarify and alter BLM's policies on natural gas emissions, but these proposed regulations do not address the key limitations in reporting and accounting for emissions that we identified.

Interior does not provide specific instructions on how to estimate natural gas emissions on the OGOR. Interior's guidance to operators for reporting natural gas emissions on the OGOR does not specify how they are to estimate reported natural gas emissions that have occurred without measurement.²⁶ Instead, BLM's guidance on natural gas emissions, NTL-

²⁵Other factors—such as operator error or negligence—could also affect the data reported on the OGOR.

²⁶Interior provides guidance on which venting, flaring, and lease use activities are permitted and where they should be reported on the OGOR in NTL-4A and its *Minerals Production Reporter Handbook*.

4A, provides a list of eight general methods operators shall use to estimate emissions, which include, among others, the use of historic production data or estimates based on the expected production of other nearby wells.²⁷ However, NTL-4A does not provide any specific detail or instruction on how to develop estimates of natural gas emissions based on these general methods. Furthermore, the guidance allows for use of any estimation method that is approved by a BLM supervisor. With regard to measurement, BLM's Onshore Oil and Gas Order No. 5 provides guidance on how to measure gas production but it does not provide any specific guidance on estimating natural gas emissions.²⁸ In addition, BLM's proposed methane and waste reduction regulations contain provisions that require operators to report quantities of all vented or flared gas, and to meter flared volumes when gas flaring meets or exceeds certain thresholds, but contain no guidance on how to estimate or measure natural gas emissions below those thresholds.

In the absence of guidance with specific instructions on how to estimate natural gas emissions, we found that operators may use varying approaches to estimate emissions. Specifically, some BLM field office officials we interviewed told us that operators may meter long-term flaring volumes but use various techniques to estimate short-term flaring, venting, and lease use emissions. Some BLM field office officials that we spoke with also said that for short-term flaring, operators may rely on "gas to oil ratios" where the gas is metered temporarily to establish the ratio between associated gas and produced oil to estimate nonmetered flaring volumes.²⁹ For venting and lease use volumes, however, BLM field office officials we interviewed told us that operators may use engineering estimates based on equipment specifications, which can vary—even for

²⁷NTL-4A, section V.2.a.-h.

²⁸Onshore Oil and Gas Order No. 5 is currently under revision, but the revisions would not include guidance on estimating natural gas emissions. See *Onshore Oil and Gas Operations; Federal and Indian Oil and Gas Leases; Measurement of Gas*, 80 Fed. Reg. 61646 (Oct. 13, 2015).

²⁹Officials in some BLM field offices questioned the accuracy of gas to oil ratios as a method for estimating gas volumes. Officials in one field office told us that using this methodology may underestimate the amount of gas emitted, while officials at another field office told us that they did not believe using gas to oil ratios could help operators estimate total gas production.

the same piece of equipment—based on the assumptions made by individual operators.

Without specific instructions from BLM on how to develop estimates of natural gas emissions, it may also be difficult for BLM’s production accountability staff to determine which method operators are using to estimate natural gas emissions and to verify their accuracy during periodic records reviews.³⁰ For example, one operator we interviewed told us that until 2 years ago, officials at the company used rough estimates to report volumes of vented, flared, or lease use gas on the OGOR, but the company recently changed course and adopted the estimation techniques EPA prescribed in its regulations for its Greenhouse Gas Reporting Program. In contrast, another operator we interviewed told us that it continues to estimate natural gas emissions based on history and experience in the field. In addition, in our limited analysis of five detailed records that BLM provided to us—which contained operators’ documentation of natural gas emissions volumes—we found that only one operator reported lease use gas, and for that case, we could not determine which method the operator used to estimate lease use volumes. Although some BLM field office officials we spoke with told us they felt that the OGOR volume estimates were fairly reliable, without consistent accounting, Interior does not have the information it needs to have reasonable assurance that it is minimizing waste on federal oil and gas leases.

Interior provides limited guidance on which OGOR categories operators are to use to report flared volumes. Interior provides limited agency-wide guidance to operators on which OGOR categories to use when reporting volumes of flared gas, and only two BLM field offices we reviewed provide any additional instruction. As described above, under BLM’s NTL-4A, field office supervisors have some discretion in determining whether an operator’s request to vent or flare beyond the initial production phase should be approved and is subject to royalties. If the BLM supervisor

³⁰During the records review process, BLM production accountability staff may periodically compare data reported on the OGOR, including volumes of natural gas emissions, with data reported in other sources or with the results of field-based inspections. These reviews, which generally take place every year for leases that are deemed “high risk” and every 3 to 4 years for other leases, are the primary means by which BLM can identify which methodology was used to estimate volumes on the OGOR and determine their accuracy.

determines that a loss of natural gas occurs for reasons beyond the operator's control, such as line failures or equipment malfunction, then the vented or flared volumes are deemed unavoidably lost and are royalty-free. If the BLM supervisor determines that the loss occurs for reasons such as negligence or the failure of lessee or operator to take all reasonable measures to prevent or control the loss of gas, then the vented or flared volumes are deemed avoidably lost and are royalty-bearing. Operators must report both royalty-free and royalty-bearing vented or flared gas volumes on the OGOR.

Based on interviews with BLM field office officials and our review of ONRR's guidance, we found that operators use four different categories to report flared gas on the OGOR, and two of these categories may also include other types of nonflared emissions. Within the OGOR, there are two categories specifically dedicated to flared gas—one for gas flared from oil wells and one for gas flared from gas wells—both of which are for royalty-free volumes. However, in the absence of clear agency-wide guidance on how to report volumes of flared gas on the OGOR—particularly royalty-bearing flared gas—some BLM field offices have allowed operators to report such volumes under two additional categories.

One of these categories is for avoidably lost oil and gas spills, which also includes royalty-bearing leaks and spills. Since 2011, two BLM field offices we reviewed have instructed operators to use this category to report royalty-bearing flaring since there is currently no reporting category on the OGOR specifically for royalty-bearing flaring. However, even with such instructions in place, officials at one of these offices told us that records reviews have shown that operators sometimes erroneously report royalty-bearing flaring under the two royalty-free flaring categories on the OGOR. The second of these additional categories that operators have used to report flaring is the category for unavoidably lost oil and gas spills, which is a royalty-free category.³¹ Including flared gas volumes under these two additional categories—which commingle flared volumes with other types of emissions—makes it difficult for Interior to account for

³¹ Officials in one BLM field office that is considering assessing royalties on some flared gas told us that in the meantime they have allowed operators to choose which category to use to report royalty-free flared gas. Some operators have chosen to use a category for unavoidably lost oil and gas spills to report flared volumes rather than the categories for flaring.

flaring on the OGOR. Moreover, because ONRR uses OGOR data to help validate royalty payments, Interior may not be able to reasonably ensure that operators are minimizing waste on federal oil and gas leases or that all royalties actually owed on flared gas are collected.³² BLM's proposed methane and waste reduction regulations do not alter OGOR categories operators should use to report flared gas.

Interior does not clearly specify which activities are to be reported under OGOR reporting categories for natural gas emissions. Interior's guidance to operators does not include specific criteria for which activities should be reported under OGOR reporting categories for natural gas emissions, and operators may not be reporting some of these activities.³³ For example, in an October 2010 report,³⁴ we found that operators did not report operational sources such as venting from oil storage tanks, pneumatic valves, or glycol dehydrators.³⁵

Some BLM field office officials we interviewed told us that operators still may not be reporting certain natural gas emissions activities on the OGOR. For example, officials at several BLM offices told us that operators generally do not report storage tank emissions. ONRR's guidance does not specify which reporting category should be used to report such emissions, though its Minerals Production Reporter Handbook requires operators to report volumes from unavoidably lost production, which according to BLM's guidance NTL-4A, includes gas vapors released from storage tanks or other low-pressure production vessels. In addition, officials at one BLM field office told us that while they believe gas emitted during well completions should be reported on the

³²To ensure accuracy in royalty collections, ONRR compares data reported on the OGOR with data that operators report on a different form—known as Form 2014—which tracks volumes measured at the royalty meter.

³³In contrast, EPA's Greenhouse Gas Reporting Program requires reporting of emissions based on emissions source or equipment type to cover natural gas emissions activities.

³⁴[GAO-11-34](#).

³⁵Pneumatic valves are valves that control gas flows, levels, temperatures, and pressures in the equipment and rely on pressurized gas for operation. Glycol dehydrators are equipment used to remove water from gas.

OGOR,³⁶ they could not point to specific guidance instructing operators where to report such volumes and were not certain of the extent to which operators were actually reporting them.

Interior officials also told us that operators are not instructed to report—and typically do not report—natural gas emissions from system-wide leaks, although there is a reporting category for unavoidably spilled and/or lost volumes. One operator told us that leaks are typically too insignificant to be reported, while another stated that if there was a gas leak, they would probably report that under the OGOR reporting category for vented emissions. Similarly, there is no guidance to operators on where to report emissions from newer technologies, such as vapor recovery units and vapor combustion units, though one operator stated that it reports gas collected from vapor recovery units under the OGOR reporting category for gas that is sold. As a result of this uncertainty with the data, Interior may not have a clear accounting of natural gas emissions, which could limit Interior’s ability to ensure that lessees pay royalties in the proper amounts and minimize waste of natural gas. In its proposed regulations, BLM has not provided additional guidance to operators on which activities should be included under the natural gas emissions reporting categories on the OGOR.

Interior does not require operators to differentiate between types of lease use volumes reported on the OGOR. Interior’s OGOR reporting category for lease use gas does not distinguish between combusted and noncombusted emission volumes, making it more difficult for Interior to accurately track progress toward reducing greenhouse gases on federal lands. Natural gas consists primarily of methane, which when combusted becomes primarily water vapor and carbon dioxide. For example, when natural gas is used to run equipment like generators, the methane is converted into carbon dioxide in the combustion process. In contrast, when natural gas is used to run pneumatic equipment on a lease, like valves to control gas flows, the gas is not combusted. Instead, some natural gas is released into the atmosphere, mostly in the form of methane. Because methane has a much greater climate impact than carbon dioxide, the impact of using the same amount of natural gas in a

³⁶During the well completion process, operators prepare a well for production by expelling liquids and mud with pressurized natural gas after drilling the well.

pneumatic valve compared to a generator is very different. As a result of current OGOR reporting requirements, combusted and noncombusted lease use volumes are reported in a single OGOR reporting category—making it difficult for Interior to accurately estimate the greenhouse gas emissions from lease use volumes reported on the OGOR.

Although Interior does not require operators to report on greenhouse gas emission volumes on the OGOR, Interior’s OGOR database is the only federal database that tracks natural gas emissions on federal leases and therefore is the most useful source of data for Interior to use when tracking greenhouse gas emissions from federal lands.³⁷ BLM’s proposed methane and waste reduction regulations would not require direct reporting on all greenhouse gas emissions, but having separate reporting categories for combusted and noncombusted lease use volumes could better position Interior to track progress against the new goals to cut methane emissions under the President’s Climate Action Plan’s Strategy to Reduce Methane Emissions.

BLM Has Not Consistently Followed Its Existing Guidance in Managing Operators’ Venting or Flaring Requests

BLM has approved operators’ requests to vent or flare gas royalty-free without having the documentation its guidance requires. Field offices have also applied BLM’s guidance differently, which has resulted in some field offices requiring royalty payments on flared gas while other field offices do not. However, BLM has recently proposed new methane and waste reduction regulations that may alter its management of venting or flaring requests in the future.

BLM Has Approved Many Venting or Flaring Requests That Do Not Comply with Its Guidance

BLM officials have approved many venting or flaring requests that do not comply with BLM’s existing guidance, NTL-4A, which requires operators to provide specific documentation for requests to vent or flare beyond a short-term basis. Generally, venting or flaring on a short-term basis in temporary or emergency circumstances is described in NTL-4A as

³⁷By contrast, although EPA does collect data on greenhouse gas emissions, it does not collect emissions data at an individual lease level or specifically for federal leases.

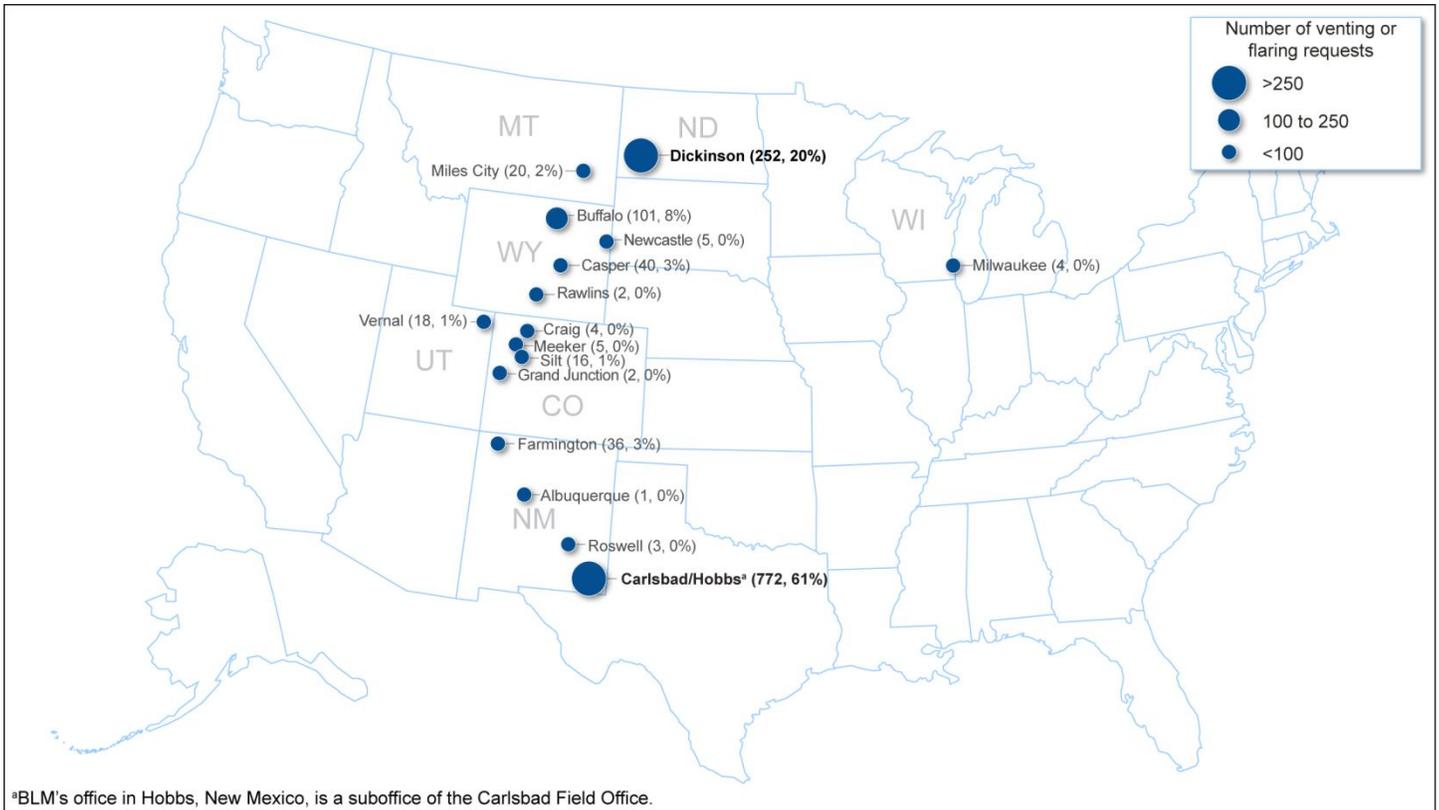
“authorized venting or flaring of gas.”³⁸ Alternatively, venting or flaring requests that are more long term in nature—described in NTL-4A as “other venting or flaring” of gas—may be approved if operators submit documentation that consists of (1) an evaluation report providing an economic and a geologic justification to flare³⁹ or (2) an action plan that will eliminate venting or flaring of the gas within 1 year from the date of application.

Requests to vent or flare gas have increased substantially in recent years. BLM reported that venting or flaring requests rose from 50 in 2005 to over 600 in 2011 and to about 1,250 in 2014. Our analysis of venting or flaring requests for fiscal year 2014 indicates that operators submitted a total of 1,281 requests to vent or flare gas to 16 BLM field offices nationwide, with over 80 percent of these requests submitted to just two field offices: Carlsbad, New Mexico, and Dickinson, North Dakota. Officials in both of these offices told us that in recent years they have been short-staffed and have had to triage backlogs of over 1,000 venting or flaring requests against other priorities, such as processing drilling permits or permitting rights-of-way for gas gathering pipeline. Figure 4 presents the number of venting or flaring requests submitted to each field office in fiscal year 2014.

³⁸NTL-4A states that venting or flaring may be authorized in the following circumstances: (1) during a temporary emergency situation, generally defined as lasting no more than 24 hours per incident and for no more than 144 hours cumulatively in a month; (2) for well purging and evaluation tests; (3) for initial production tests for a period of up to 30 days or 50 million cubic feet of gas, whichever occurs first; and (4) for routine or special well tests, if approved by the supervisor.

³⁹The required report must demonstrate that “expenditures necessary to market or beneficially use such gas are not economically justified and that conservation of the gas, if required, would lead to the premature abandonment of recoverable oil reserves and ultimately to a greater loss of equivalent energy than would be recovered if the venting or flaring were permitted to continue.”

Figure 4: Requests to Vent or Flare Natural Gas Submitted to Bureau of Land Management (BLM) Field Offices, Fiscal Year 2014



Sources: GAO analysis of BLM data; Map Resources (map). | GAO-16-607

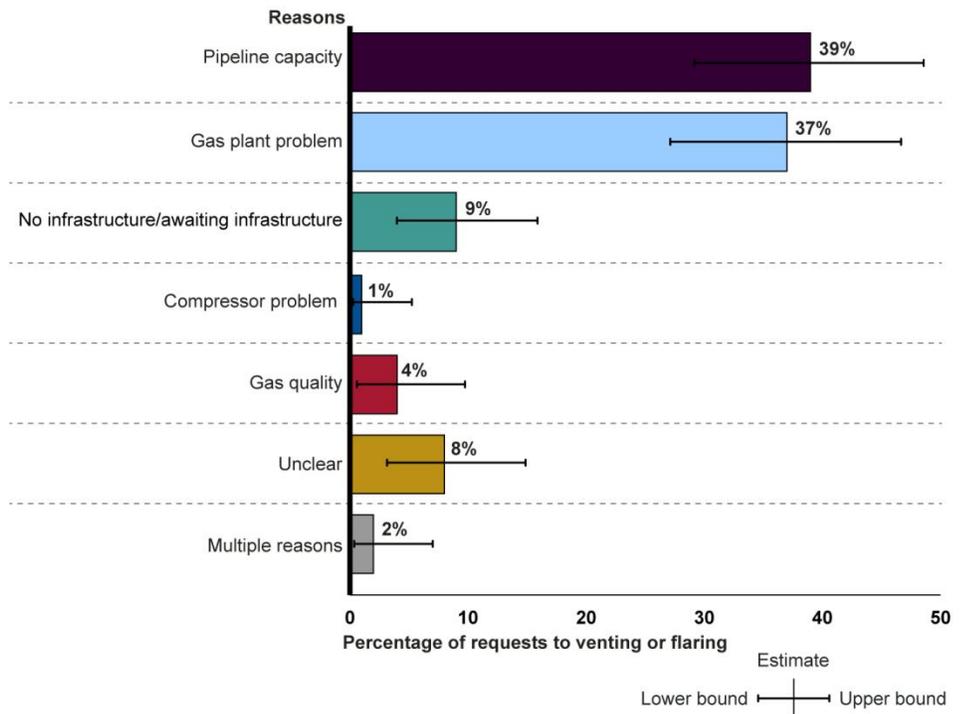
To better understand the reasons operators submitted requests to vent or flare gas and the extent to which BLM approved requests, we analyzed a random sample of 100 requests submitted to BLM field offices in fiscal year 2014.⁴⁰ Based on our analysis of the sample, we estimate that 99

⁴⁰Our findings can be generalized to the full universe of 1,281 venting or flaring requests across the 16 BLM field offices.

percent of operator submitted requests were requests to flare (rather than vent).⁴¹

Based on our sample of venting or flaring requests, we found that operators cited a variety of reasons they needed to vent or flare. As shown in figure 5, the vast majority of the requests cited limitations with existing infrastructure as the reason the operators needed to vent or flare gas, such as constrained pipeline capacity or problems with receiving gas plants. In contrast, only an estimated 9 percent of the requests cited that wells were not connected to—or were waiting to be connected to—gas gathering infrastructure as the reason operators needed to vent or flare gas.

Figure 5: Reasons Cited by Operators to Vent or Flare by Estimated Percentage of Requests to Vent or Flare, Fiscal Year 2014

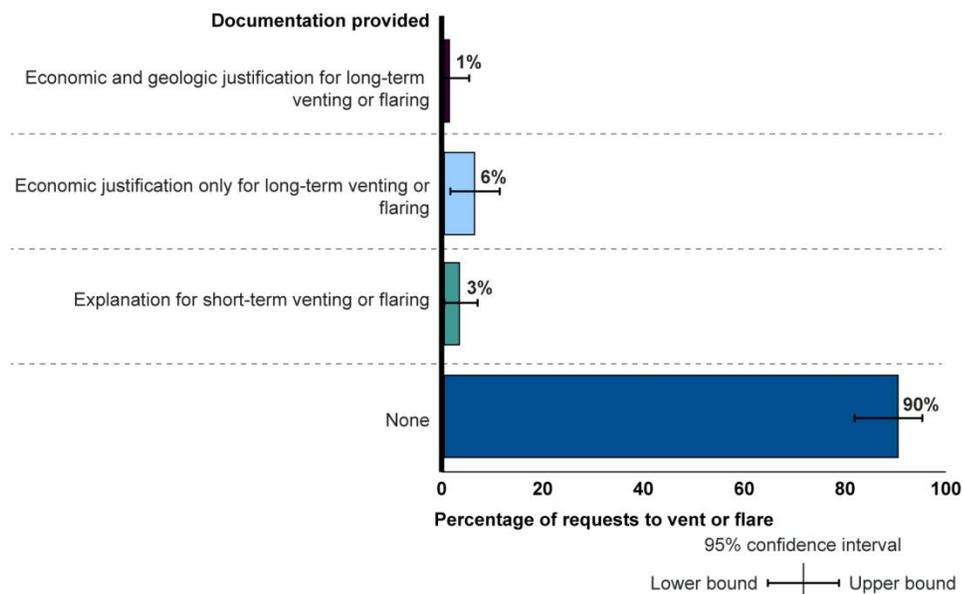


Source: GAO analysis of Bureau of Land Management data. | GAO-16-607

⁴¹The 95 percent confidence interval for this estimate is (94.45, 99.97).

Based on our sample, we also found that almost all venting or flaring requests in fiscal year 2014 did not contain the documentation needed to meet the criteria described in BLM's guidance NTL-4A for long-term venting or flaring or an explanation for authorized short-term venting or flaring. Specifically, we estimate that 90 percent of venting or flaring requests did not have the documentation for BLM to determine whether approval of long-term venting or flaring was justified or an explanation for authorized short-term venting or flaring.⁴² Figure 6 shows our estimates of the documentation that operators provided to BLM as a justification to vent or flare.

Figure 6: Documentation Provided in Requests to Vent or Flare by Estimated Percentage of Requests to Vent or Flare, Fiscal Year 2014

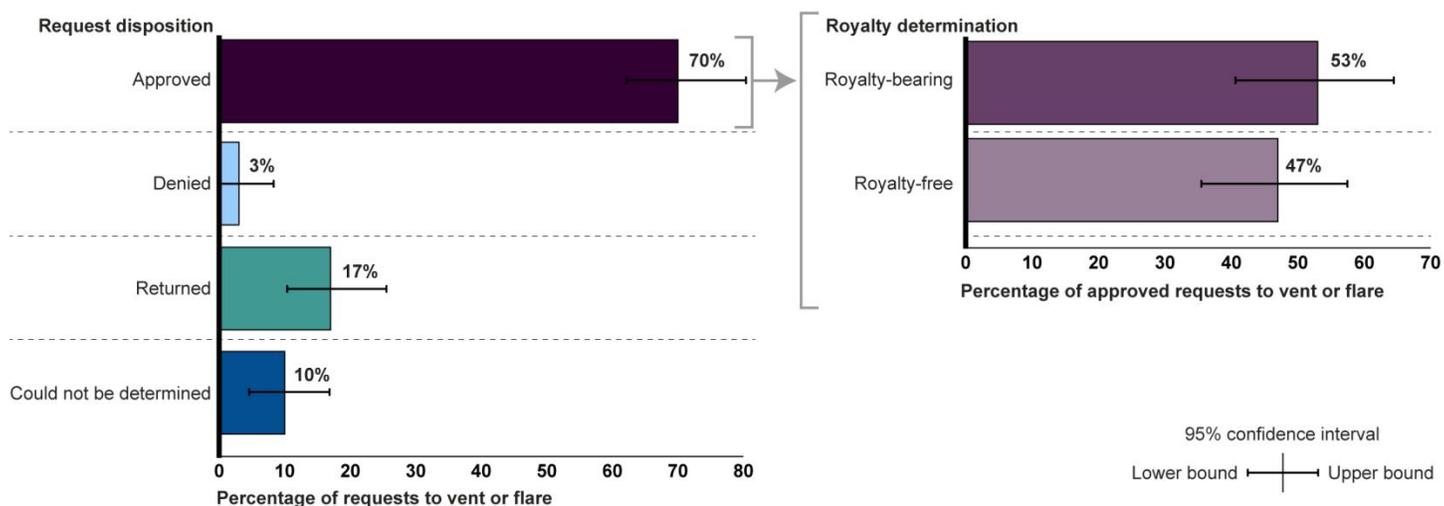


Source: GAO analysis of Bureau of Land Management data. | GAO-16-607

⁴²The 95 percent confidence interval for this estimate is (82.4, 95.1).

Nonetheless, we estimate that BLM approved about 70 percent of venting or flaring requests submitted in fiscal year 2014,⁴³ and of the approved requests, roughly half were approved royalty-free (see fig. 7). We estimate that nearly all of the requests that BLM approved royalty-free did not include the documentation required for long-term venting or flaring.⁴⁴

Figure 7: BLM’s Approvals by Estimated Percentage of Requests to Vent or Flare with Royalty Determinations of Approved Requests, Fiscal Year 2014



Source: GAO analysis of Bureau of Land Management data. | GAO-16-607

In discussing our sample with BLM officials, these officials said that Interior recognizes there are systemic shortcomings in how venting or flaring requests are submitted and approved. As discussed above, Interior officials told us that their focus has historically been on collecting data on royalty-bearing oil and gas production, so natural gas emissions have

⁴³The 95 percent confidence interval for this estimate is (61.33, 78.67). We estimate that the remaining 30 percent of the requests were either returned to the operator or denied or we could not determine the disposition of the request. The 95 percent confidence interval for this estimate is (21.33, 38.67).

⁴⁴Specifically, we estimate that 97 percent of the approved and royalty-free requests did not include the necessary documentation. The 95 percent confidence interval for this estimate is (84.2, 99.9).

received less attention. In addition, BLM field office officials have described heavy workloads and a shortage of personnel that have hindered their ability to review and approve the high volumes of venting or flaring requests they have received from operators. Thus, operators have submitted—and received BLM’s approvals for—venting or flaring requests that do not contain all of the documentation required by NTL-4A. However, without collecting and reviewing the required documentation BLM supervisors cannot demonstrate that they have followed existing guidance or that they have the necessary information to inform their decisions about whether venting or flaring is needed or whether such volumes should be subject to royalties.

Selected Field Offices Have Applied BLM Guidance Differently to Venting or Flaring Requests

Officials in the six field offices we reviewed interpreted NTL-4A differently with respect to charging royalties on approved venting or flaring, which may have resulted in the operators seeking to vent or flare not receiving consistent treatment across offices. Two of the six BLM field offices we reviewed—the Carlsbad, New Mexico, office and the Casper, Wyoming, office—approved long-term flaring of some gas but also determined that the flared gas was avoidably lost and therefore subject to royalties. The BLM field office in Dickinson, North Dakota, is also considering doing so. The other three field offices we reviewed—in Farmington, New Mexico; Miles City, Montana; and Vernal, Utah—have interpreted NTL-4A to mean that when the authorizing official approves a request to flare, the flared gas will be treated as unavoidably lost gas, which is royalty-free.

Officials we spoke with in the Carlsbad office told us that they charged royalties on flared gas because oil production in their region boomed and operators made an economic choice to flare gas associated with their oil wells—and pay the royalties—rather than wait until gas gathering pipeline was available. Before deciding to charge royalties, field office officials we interviewed told us that they met with operators in the region to determine when wells could be shut in without endangering reservoir life and recoverable reserves in order to help them determine whether flared gas in the region was avoidably or unavoidably lost. As a result of these discussions, these officials told us they concluded that within their region operators could generally restrict production at their established wells without endangering the amount of oil that these wells could ultimately produce. Therefore, these officials concluded that much of the gas flared

from oil wells in the region was considered avoidably lost or “wasted gas” and therefore royalties were due. Further, field office officials told us that charging royalties on flared gas could provide a small incentive for operators to develop infrastructure for gathering gas from oil wells.⁴⁵ According to our analysis of ONRR data, royalties from flaring from onshore federal leases generated \$4.5 million in revenue in fiscal year 2014.⁴⁶

Officials in the Casper office told us that they followed Interior’s guidance, which they interpreted as allowing them to charge royalties on gas flared from oil wells under some circumstances. Specifically, the officials we interviewed told us that operators citing lack of infrastructure to transport gas produced on oil wells could be approved to flare royalty-free if they could economically justify the lack of infrastructure, such as by the cost to connect to the nearest available pipeline. However, operators citing lack of pipeline capacity on existing pipelines as a justification to flare would be required to pay royalties. This is because the operators would have generally chosen to expand their production beyond the capacity of the existing pipeline infrastructure, knowing that capacity constraints could result in the need to flare on some occasions.

Officials in the Dickinson office told us that they are considering charging royalties on some flared gas. As a result of an increase in flaring requests in recent years, as well as limited staff and a concurrent increase in the number of applications for drilling permits, this office faced a backlog of 2,211 flaring requests by August 2015. In that month, BLM officials in the Dickinson office proposed a formula for resolving 1,943 of their 2,211 pending flaring requests—requests for flaring that has already concluded. The proposed formula would assign the first 6 days of flaring as unavoidably lost (i.e., no royalties due) gas with flaring that exceeded the 6-day threshold as avoidably lost (i.e., royalties due) gas.⁴⁷ For the

⁴⁵Officials in the Carlsbad office and its suboffice in Hobbs, New Mexico, approved all of the royalty-bearing venting or flaring requests that were present in our sample.

⁴⁶Of this total, \$4.4 million were collected from onshore federal leases in New Mexico.

⁴⁷The Dickinson office’s proposed formula resembles the definition for a short-term emergency situation under the “authorized venting and flaring of gas” category in NTL-4A. Operators seeking to flare under this provision are limited to a cumulative 144 hours in a month (6 days).

remaining 268 of the 2,211 pending flaring requests—requests for flaring that was ongoing or may occur in the future—the field office proposed reviewing the merits of each request individually, as the guidance outlines, to determine whether gas was or would be avoidably or unavoidably lost. According to a field office official, however, operators formally objected to the proposed formula, so officials may have to review the merits of each venting or flaring request individually.

In the three other field offices we reviewed—Farmington, New Mexico; Miles City, Montana; and Vernal, Utah—officials cited various reasons for not charging royalties on approved long-term flaring requests. Overall, these offices tended to generalize about the industry in their regions and the need to vent or flare, approving all requests as unavoidably lost gas and royalty-free. For example, in the Farmington office, officials we spoke with told us that their region was dominated by gas development, so flaring was not as much an issue for their office. In the Miles City office, officials we interviewed told us that there was little associated gas at oil wells in their region, and that charging royalties on flared gas might make it more costly for operators to drill new wells or shorten the life of existing wells, which they were reluctant to do. In the Vernal office, officials we spoke with told us that they had considered charging royalties on flared gas, but they were concerned that the alternative to flaring—shutting in a well—might damage oil recoverability from wells in their region.

BLM’s Proposed Regulations May Alter How It Manages Future Venting or Flaring Requests

BLM’s proposed methane and waste reduction regulations would reduce the number of venting or flaring requests field offices officials will have to individually review and acknowledges the substantial variation in how it has interpreted and applied its existing guidance. In this regard, the proposed regulations, if adopted, would include updated guidance on which gas volumes should be considered avoidably or unavoidably lost. Specifically, instead of requiring BLM field office officials to review the merits of each flaring request individually, BLM proposes setting monthly flaring limits on each well with a requirement that operators meter flaring above certain monthly limits. According to officials, if upon inspection or review, an operator is found to be exceeding flaring limits, it would be subject to penalties for noncompliance with the regulations. However, operators could seek an exception from BLM to flare above the monthly per-well limit based on an economic and geologic justification similar to

that required in the existing guidance.⁴⁸ The proposed regulations also require operators to communicate their anticipated gas collection needs to pipeline operators at the time they apply to drill a new well, which may reduce an operator's need to flare gas assuming the infrastructure is developed. The proposed regulations also would, among other things, mandate reductions in venting from pneumatic devices and require inspections to detect and repair leaks in the oil and gas production process. As discussed above, Interior officials we spoke with told us that BLM plans to finalize the proposed regulations by the end of calendar year 2016, and they told us that finalizing the proposed regulations is an Administration priority.

Conclusions

To fulfill its responsibility to ensure that operators use all reasonable precautions to prevent waste of oil or gas on federal leases, Interior must be able to account for oil and gas produced from these leases, including how it is sold, lost, or used. Natural gas emissions are an important component of this accounting and affect both BLM's collection of royalties as well as its tracking of harmful greenhouse gas emissions from federal leases. Since Interior has historically focused on royalty-bearing oil and gas production and has limited guidance on how to report natural gas emissions, it cannot yet consistently account for these emissions on federal leases. Better guidance for OGOR reporting could improve Interior's ability to account for natural gas emissions and better ensure that royalties are collected where appropriate on these emissions. Further, improved reporting from operators could also help Interior better track its efforts to curb greenhouse gases from federal leases and its new goals for methane reduction.

⁴⁸The proposal states that exemptions would only be allowed when an operator can show that the net costs of compliance with the flaring limit would be sufficient to cause the operator to cease production and abandon "significant" recoverable oil reserves. An operator would have to provide documentation about the quantity of flaring from the lease, projected costs of capture (including an evaluation of on-site approaches), and projected prices and returns on oil and gas production from the lease. Where operators need to project future costs and returns, the projections would be required to cover either the life of each lease or the next 15 years, whichever is less.

Recommendations for Executive Action

We are making four recommendations to the Secretary of the Interior.

To help improve reporting of emissions data on the OGOR, the Secretary of the Interior should direct BLM or ONRR, as appropriate, to take the following four actions:

- BLM should provide additional guidance on how to estimate natural gas emissions from federal oil and gas leases.
- ONRR should provide additional guidance on
 - how to report royalty-free and royalty-bearing flaring and consider creating a separate category for royalty-bearing flaring;
 - how to report certain unreported or underreported emissions, such as emissions from storage tanks and gas vented during well completions; and
 - how to differentiate between combusted and noncombusted lease use volumes reported on the OGOR, which could assist Interior in measuring its progress toward greenhouse gas reduction goals.

Agency Comments and Our Evaluation

We provided our draft report to Interior for review and comment. Interior provided written comments, in which it concurred with two of the six recommendations in the draft report, partly concurred with two others, and did not concur with the remaining two recommendations. Interior's comments reflected the views of BLM and ONRR. Interior's comments are reproduced in appendix III and key areas are discussed below. Interior also provided technical comments, which we incorporated as appropriate.

Interior partially concurred with our third and fourth recommendations, which would have ONRR provide guidance on how to report certain unreported or underreported emissions and on how to differentiate between combusted and non-combusted lease use volumes on the OGOR, respectively. Regarding these recommendations, Interior said ONRR would defer to BLM to provide guidance on how the emissions discussed should be accounted for by Interior. Once these decisions are made, ONRR would work with BLM to develop requirements for reporting volumes on the OGOR and collecting royalties, as appropriate. We recognize that these actions will require a collaborative effort between ONRR and BLM, as noted in Interior's letter, and if implemented as described, would address the intent of our third and fourth recommendations.

Interior did not concur with two recommendations included in the draft report, which would have BLM apply its existing guidance on venting and flaring and issue interim guidance on the circumstances under which long-term flaring would be subject to royalties, respectively. Regarding these recommendations, Interior noted that finalizing BLM's proposed rule, the Methane and Waste Prevention Rule, will directly address many of the concerns pointed out in the findings and recommendations directed at BLM. In its letter, Interior stated that finalizing the proposed rule is an Administration priority, and that it expects the rule to be finalized by the end of calendar year 2016. Furthermore, Interior said that issuing interim guidance before the rule is finalized would divert resources from BLM's rulemaking effort, and would likely create significant confusion among BLM staff and the industry when the new rule is issued several months later. In response to BLM's timeframe and stated prioritization for finalizing its proposed rule, we removed these recommendations and modified the report accordingly.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies to the appropriate congressional committees, the Secretary of the Interior, and other interested parties. In addition, the report will be available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-3841 or ruscof@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix IV.



Frank Rusco
Director, Natural Resources and Environment

Appendix I: Regulatory Actions to Reduce Natural Gas Emissions in Selected States

Since operators of federal leases may be subject to state regulations and policies regarding natural gas emissions, we reviewed the regulatory activity in five states with high federal oil and gas production and emissions. One of the five states we reviewed—Colorado—has adopted regulations intended to reduce natural gas emissions from oil and gas produced on all lands in the state. Two others—North Dakota and Wyoming—have taken similar regulatory actions within specific areas of their states. Another state—Utah—has taken regulatory actions that indirectly address natural gas emissions. The fifth state we reviewed—New Mexico—recently took an action that may reduce natural gas emissions.

These states have undertaken various actions to address natural gas emissions, as follows:

- Colorado: In February 2014, Colorado adopted regulations that apply statewide to limit venting¹ and to capture fugitive emissions, such as those emissions that leak from equipment.² These regulations include a requirement that operators collect or flare 95 percent of gas associated with new wells.³ In addition, operators are required to use leak detection equipment at oil and gas facilities across the state.⁴ Colorado’s leak detection requirements vary by the amount of emissions produced at a facility, with higher-producing facilities required to check for leaks more often.⁵ In addition, the regulations

¹Vented gas is a source of volatile organic compounds, a group of chemicals that contribute to the formation of ground-level ozone. According to the Environmental Protection Agency (EPA), the oil and gas industry is one of the largest sources of volatile organic compounds. Under the Clean Air Act, EPA may designate areas that do not meet the ground-level air quality standard for ozone as “ozone nonattainment areas.” 42 U.S.C. § 7407(d). States may impose measures affecting the oil and gas operators, as well as other industries and activities in that state, as part of their plans to reduce emissions of volatile organic compounds and meet the air quality standard in future years.

²Colorado Air Quality Control Commission Regulations, Regulation 7, Control of Ozone via Ozone Precursors and Control of Hydrocarbons via Oil and Gas Emissions (Emissions of Volatile Organic Compounds and Nitrogen Oxides), 5 CCR 1001-9, sections XII, XVII, and XVIII (Colorado Regulations).

³Colorado Regulations, at section XVII.G.

⁴Colorado Regulations, at section XVII.F.

⁵Colorado Regulations, at sections XVIII and XVII.F.

mandate the use of low-bleed pneumatic devices and increased the gas capture target for certain storage tanks.⁶

- North Dakota: North Dakota has targeted the amount of gas flared from two geologic formations in the state by imposing restrictions on the amount of gas operators may flare from existing and new sources.⁷ North Dakota has imposed gas capture targets to decrease flaring by setting goals for the amount of gas that operators must collect each year; these goals increase in later years. Operators are currently working to meet a gas capture target of 85 percent for November 2016. North Dakota also requires operators, when they apply to drill a new oil well, to include a gas capture plan. According to state officials, gas capture plans help facilitate discussions between oil producers and firms that process and transport gas, and they have improved the speed at which new wells are connected to gas gathering infrastructure. State officials also told us that to meet the state's gas capture target, operators have reduced production at some wells and delayed completing others.
- Wyoming: According to state officials, reducing vented natural gas emissions has been a focus for the state of Wyoming. Wyoming has an ozone nonattainment area in the Upper Green River Basin, and regulations require operators in the nonattainment area, among other things, to use leak detection equipment to identify facilities with fugitive emissions.⁸ Generally, operators must check for leaks quarterly under the state's leak detection program, but according to state officials, operators with satisfactory prior performance records may be allowed to check for leaks less frequently.⁹ The regulations also require that operators replace high-bleed pneumatic controllers with low-bleed controllers.¹⁰ According to a state official, Wyoming is reviewing its flaring rules and considering requiring gas capture plans.

⁶Colorado Regulations, at section XII.

⁷North Dakota Industrial Commission Order No. 24665 (July 1, 2014), and North Dakota Industrial Commission Order No. 24665 Policy/Guidance Version 102215.

⁸Wyoming Department of Environmental Quality, Air Quality Division, Standards and Regulations, Nonattainment Area Regulations, ch. 8 (June 2015) (Wyoming regulations).

⁹Wyoming regulations, at section 6(g).

¹⁰Wyoming regulations, at section 6(f).

- Utah: Utah has adopted regulations requiring oil and gas operators to minimize their emissions of volatile organic compounds¹¹—a group of chemicals that contribute to the formation of ground-level ozone—which effectively prohibit venting from oil and gas wells, according to a state official. According to this official, because Utah is concerned with the Uinta Basin being designated an ozone nonattainment area the state’s actions have been focused on reducing ozone in the area rather than on reducing volumes of flared gas.
- New Mexico: According to state officials, New Mexico was considering actions that could reduce emissions from oil and gas leases in the state, including on federal leases, and in April 2016, the New Mexico Energy, Minerals and Natural Resources Department issued a notice to operators of a new gas capture planning requirement. Effective May 1, 2016, operators are required to submit a gas capture plan outlining actions to be taken to reduce venting and flaring at new well completions.

¹¹State of Utah, Department of Air Quality, Air Quality Rules, R307-501-4 (a).

Appendix II: Objectives, Scope, and Methodology

This report examines (1) the extent to which the Department of the Interior (Interior) can account for natural gas emissions from onshore federal leases and (2) how selected Bureau of Land Management (BLM) field offices have managed requests to vent or flare natural gas emissions on onshore leases.

To conduct this work, we reviewed relevant laws, regulations, and BLM and Office of Natural Resources Revenue (ONRR) guidance. We also reviewed independent studies of Interior's accounting of onshore natural gas emissions conducted by Interior's Office of Inspector General as well as related reports prepared by other federal entities, such as the Environmental Protection Agency (EPA) and the Congressional Research Service. We also reviewed BLM's proposed regulations to reduce waste of natural gas from venting, flaring, and leaks during oil and natural gas production activities on onshore federal and Indian leases that were proposed in January 2016.¹

We interviewed officials from Interior's offices responsible for accounting for onshore natural gas emissions—BLM and ONRR. Specifically, we interviewed BLM officials in BLM headquarters; BLM's National Operations Center in Lakewood, Colorado; and six BLM field offices we selected primarily based on (1) the volume of flared gas emitted in that region, (2) the amount of lease use gas consumed in that region, and (3) the volume of vented gas in that region in fiscal year 2014, the most recent year for which complete data were available. These field offices are located in Carlsbad, New Mexico; Casper, Wyoming; Dickinson, North Dakota; Farmington, New Mexico; Miles City, Montana; and Vernal, Utah. We visited the two BLM field offices overseeing the largest amount of flaring—Carlsbad, New Mexico, and Dickinson, North Dakota. Because this was a nonprobability sample, our findings are not generalizable to other BLM field offices but help illustrate how some offices have accounted for and managed natural gas emissions. We also visited and interviewed officials at ONRR's office in Lakewood, Colorado. In addition, we interviewed representatives from oil and gas companies (operators) and environmental organizations.

¹*Waste Prevention, Production Subject to Royalties, and Resource Conservation*, 81 Fed. Reg. 6616 (2016) (to be codified at new 43 C.F.R. subparts 3178 and 3179) (proposed Jan. 22, 2016).

To examine the extent to which Interior can account for natural gas emissions from onshore federal leases, we reviewed the guidance Interior provides on reporting natural gas emissions, including BLM's Notices to Lessees and instruction memorandums and ONRR's Minerals Production Reporter Handbook.² To examine the methodology used by operators to measure or estimate natural gas emissions, we reviewed the instructions in ONRR's Minerals Production Reporter Handbook on how operators are to report natural gas emissions in monthly Oil and Gas Operations Reports (OGOR). We interviewed BLM and ONRR officials on how natural gas emissions are estimated and reported on the OGOR. We obtained contact information for operators from the field offices and interviewed representatives from four operators operating in New Mexico and North Dakota that were able to meet with us during our fieldwork. We asked them how they calculated and reported natural gas emission volumes for the OGOR. We examined five records provided by BLM for examples of documentation of natural gas emissions volumes that operators submitted to BLM for its records review.³ To examine the guidance BLM provides to operators regarding reporting flared volumes on the OGOR, we reviewed BLM's existing guidance on venting and flaring—Notice to Lessees and Operators of Onshore Federal and Indian Oil and Gas Leases (NTL-4A)—and interviewed officials from our selected field offices on how such volumes are to be reported on the OGOR. To compare Interior's methodology for measuring and estimating natural gas emissions with that from another agency, we also examined how EPA collects emissions data from operators for its Greenhouse Gas Inventory and Greenhouse Gas Reporting programs.

To examine how selected BLM field offices managed requests to vent or flare natural gas emissions on onshore federal leases, we reviewed BLM regulations and documents and interviewed BLM officials. To examine BLM's actions to implement NTL-4A, we analyzed all fiscal year 2014

²BLM's instruction memorandums are temporary directives that supplement the BLM manual, which contains BLM policy and program direction. BLM's Notices to Lessees supplement regulations for oil and gas operations for specific types of activities or to address local or regional issues. ONRR's *Minerals Production Reporter Handbook* is a reference document for operators responsible for reporting minerals operations information to ONRR.

³Of those five records, one record contained documentation from an operator showing its estimated lease use volumes.

venting or flaring requests recorded in BLM's Automated Fluid Minerals Support System. Fiscal year 2014 was the most recent year for which BLM could provide complete data. Specifically, we examined electronic data for 1,281 venting or flaring requests that were sent to 17 BLM field offices nationwide. We assessed the reliability of these data by interviewing knowledgeable BLM officials responsible for data entry and compared our data set with other published data. We determined that these data were sufficiently reliable for assessing BLM field office compliance with BLM's venting and flaring guidance.

To better understand the rationale behind BLM's acceptance or rejection of these requests, we selected a simple random sample of 100 of the 1,281 venting or flaring requests for further review. Estimates based on a probability sample are subject to sampling error. Because we followed a probability procedure based on random selections, our sample is only one of a large number of samples that we might have drawn. Since each sample could have provided different estimates, we express our confidence in the precision of our particular sample's results as a 95 percent confidence interval (e.g., plus or minus 10 percentage points). This is the interval that would contain the actual population value for 95 percent of the samples we could have drawn. These findings can be generalized to all BLM field offices. We requested additional documentation from BLM field offices for 64 of these 100 requests that based on our review of the venting or flaring requests did not appear to result in revenue-bearing flaring. For each of these 100 requests, we reviewed the remarks field and any additional documentation that we requested and received, and determined for each venting or flaring request the NTL-4A provision and rationale, if applicable, that was used to justify royalty-free venting or flaring. We also interviewed BLM field office officials from our six selected field offices about implementation of NTL-4A in their respective offices.

To describe the actions some states have taken to address natural gas emissions on onshore leases, we selected the five states with the largest federal production of oil and gas as reported by operators on the OGOR for fiscal year 2014 (see app. I). These states were Colorado, New Mexico, North Dakota, Utah, and Wyoming. We reviewed venting and flaring regulations and policies for each state. Using a standard set of questions, we also interviewed the air quality and oil conservation offices for each of the selected states. Because this was a nonprobability sample, our findings from these states are not generalizable to other states but provide information on actions some states have taken to reduce natural gas emissions from onshore leases.

We conducted this performance audit from January 2015 to July 2016 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix III: Comments from the Department of the Interior



United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, D.C. 20240

JUN 27 2016

Mr. Frank Rusco
Director
Natural Resources and Environment
U.S. Government Accountability Office
441 G Street, NW
Washington, DC 20548

Dear Mr. Rusco:

Thank you for providing the Department of the Interior (Department) the opportunity to review and comment on the draft Government Accountability Office (GAO) report entitled *Oil and Gas: Interior Could Do More to Account for and Manage Natural Gas Emissions* (GAO-16-607). We appreciate GAO's analysis of the Department's management of natural gas emissions onshore.

GAO is making six recommendations to the Department. These findings and recommendations will enhance the Bureau of Land Management's (BLM) ability to improve reporting of emissions data on the monthly Oil and Gas Operations Reports (OGOR), help BLM ensure compliance with existing guidance until its proposed regulations go into effect, and ensure the Office of Natural Resources Revenue (ONRR) provides additional guidance on emissions data reporting. The BLM and ONRR will work collaboratively to take the planned actions.

As noted in the draft report, the BLM is finalizing a proposed rule, the Methane and Waste Prevention Rule, to reduce wasteful flaring, venting, and leaking of natural gas from oil and gas production on public lands. This effort updates the BLM's more than three decades old venting and flaring rules to require common sense and cost-effective measures to reduce the waste of gas, recognizing recent technological advances in oil and gas production. Furthermore, the rule aims to increase our nation's natural gas supplies, reduce environmental damage from venting and flaring, and ensure a fair return for federal taxpayers, Tribes, and states. The comment period on the proposed rule closed on April 22, 2016, and the Department expects to finalize these regulations by the end of calendar year 2016. The final rule will directly address many of the concerns pointed out in the findings and recommendations directed at BLM.

To help improve reporting of emissions data on the OGOR, the GAO made the following recommendation to the Secretary of the Interior to direct,

Recommendation 1: BLM should provide additional guidance on how to estimate natural gas emissions from federal oil and gas leases.

Response: Concur. As proposed, the Methane and Waste Prevention Rule would require operators to estimate or measure (depending on the source and quantity of the gas) natural gas

emissions from sources on federal oil and gas leases, and to report those emissions to the Department under applicable ONRR reporting requirements. The comment period for the proposed rule closed on April 22, 2016. The BLM received over 330,000 comments on the proposed rule and is currently analyzing those comments. Once these comments are addressed, technical and policy issues are resolved and the rule is finalized, the BLM will work with the ONRR to issue technical guidance to operators on acceptable methods for estimating natural gas emissions from these sources, including reporting which method the operator used in reporting.

Recommendation 2: ONRR should provide additional guidance on how to report royalty-free and royalty-bearing flaring, and consider creating a separate category for royalty-bearing flaring.

Response: Concur. Currently, ONRR requires reporting of avoidably lost oil, gas, or condensate under Disposition Code 08 (Spilled and/or lost – avoidable – royalty due) on the Oil and Gas Operations Report (OGOR), Form ONRR-4054. To increase the granularity of the reported data, ONRR concurs with the recommendation to add a separate reporting category to differentiate between liquids and gases. Additionally, ONRR intends to differentiate further by adding new disposition codes to distinguish royalty-bearing flared gas from royalty-bearing vented gas. ONRR currently requires operators to report royalty-free vented gas-well gas, royalty free vented oil-well gas, royalty-free flared gas-well gas, and royalty free flared oil-well gas using independent disposition codes. ONRR plans to issue detailed guidance to operators which will include specific criteria as to how the identified activities should be reported under the existing and the new disposition codes.

Recommendation 3: ONRR should provide additional guidance on how to report certain unreported or underreported emissions, such as emissions from storage tanks and gas vented during well completions.

Response: Partially Concur. The regulatory responsibility for tracking and categorizing emissions during oil and gas activities, as well as authorizing those emissions to occur with or without royalties due, lies exclusively with BLM and BSEE. Once those determinations are made, ONRR has the responsibility to require accurate production and royalty reporting based on those decisions and to collect every dollar due for emissions that are determined to be royalty-bearing volumes. Because the expertise and responsibility related to tracking and authorizing emissions from storage tanks and gas vented during well completions lies with BLM or BSEE, we defer to those agencies on the content and feasibility of providing guidance on how to report such emissions and enforce those requirements. Once those decisions are made, ONRR will work collaboratively with our partner agencies to then develop reporting requirements for those volumes on the OGOR and to collect royalties on any such emissions that are determined by BLM and BSEE to be royalty-bearing volumes.

Recommendation 4: ONRR should provide additional guidance on how to differentiate between combusted and non-combusted lease use volumes reported on the OGOR, which could assist Interior in measuring its progress towards greenhouse gas reduction goals.

Response: Partially concur. Lease terms and regulations allow operators to use oil or gas royalty free if the oil or gas is used on the lease or agreement for beneficial purposes. Currently, ONRR requires operators to report aggregate beneficial use volumes on the OGOR under

Disposition Code 20 (Used on lease/agreement – native production only) at the lease or agreement level. ONRR defers to the land management agencies to provide guidance on how the combusted and non-combusted beneficial use lease volumes are measured, estimated, and/or allocated. Once those decisions are made, ONRR agrees to provide guidance on which disposition codes operators should use to report combusted and non-combusted lease use volumes on the OGOR.

Recommendation 5: To help ensure that BLM complies with and clarifies how to interpret and apply BLM's existing guidance (NTL-4A) until its proposed regulations go into effect, the Secretary of the Interior should direct BLM to take steps to collect the required economic and geologic justification documents or action plans from operators.

Response: Non-concur. As proposed, the Methane and Waste Prevention Rule would require operators to provide gas capture plans at the Application for Permit to Drill (APD) stage, as well as economic and geologic data to support royalty-free flaring or requests for alternative flaring limits. Finalizing that rule is an Administration priority. Issuing interim guidance now would require the BLM to divert resources from the rulemaking effort, and would likely create significant confusion among BLM staff and in the industry when the new rule is issued several months later.

Recommendation 6: To help ensure that BLM complies with and clarifies how to interpret and apply BLM's existing guidance (NTL-4A) until its proposed regulations go into effect, the Secretary of the Interior should direct BLM to take steps to issue interim guidance to clarify the circumstances, if any, under which approved long-term flaring may be subject to royalties.

Response: Non-concur. While the BLM agrees that there is some variation across BLM offices in the application of NTL-4A, and that clarification is needed on when flared gas is considered avoidably lost and subject to royalties, the proposed Methane and Waste Prevention Rule is intended to resolve those discrepancies and provide the necessary clarification. Finalizing that rule is an Administration priority. Issuing interim guidance now would require the BLM to divert resources from the rulemaking effort, and would likely create significant confusion among BLM staff and in the industry when the new rule is issued several months later.

If you have any questions or need additional information, please contact me.

Sincerely,



Kristen J. Sarri
Principal Deputy Assistant Secretary
Policy, Management and Budget

Appendix IV: GAO Contact and Staff Acknowledgments

GAO Contact

Frank Rusco, (202) 512-3841 or ruscof@gao.gov

Staff Acknowledgments

In addition to the contact named above, Dan Haas (Assistant Director), Carl Barden, Chuck Bausell, Richard Burkard, Keya Chateauf, Cindy Gilbert, Paul Kazemsky, Alison O'Neill, Katrina Pekar-Carpenter, Sara Sullivan, Jack Wang, and Arvin Wu made key contributions to this report.

Appendix V: Accessible Data

Agency Comment Letter

Text of Appendix III:
Comments from the
Department of the Interior

Page 1

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Sincerely,

Kristen J. Sarri

Principal Deputy Assistant Secretary

Policy, Management and Budget

Data
Tables/Accessible
Text

Accessible Text for Figure 1: Illustrative Example of Onshore Production and Associated Sources of Vented or Flared Gas

Drilling - Well completions: During the drilling phase, operators need to clear wells of mud and debris to transform a drilled well into a producing well, and they may vent or flare gas during this process.

Production - Associated gas from oil wells: Operators may need to flare associated natural gas if the well is not connected to a gathering line, or if there is not sufficient capacity in existing gas gathering infrastructure.

Operations - Pneumatic valves: Pneumatic valves open or close to maintain liquid level, pressure, or temperature and are often powered by pressurized natural gas. A small amount of gas is vented each time the valve opens or closes.

Storage - Crude oil storage tanks: When crude oil is transferred to storage tanks, the gas dissolved in the crude oil may vaporize and collect in the space between tank liquids and the top of the tank. Operators may vent or flare these vapors.

Data Table for Figure 2: Volumes of Flared Natural Gas from Oil Wells on Federal Lands in 2013

State	Flared oil well gas (thousand cubic feet)
"AK"	6578
"CA"	313672
"CO"	189120
"IL"	5320
"LA"	59072
"MI"	32021
"MT"	707888
"ND"	11899965
"NM"	5466244
"OH"	24
"OK"	5533
"SD"	4256801
"TX"	1052
"UT"	284581
"WY"	1048858

Data Table for Figure 4: Requests to Vent or Flare Natural Gas Submitted to Bureau of Land Management (BLM) Field Offices, Fiscal Year 2014

Field office	Number of venting and flaring requests	Percent of overall venting and flaring requests
Carlsbad/Hobbs ^a	772	61
Dickinson	252	20
Buffalo	101	8
Casper	40	3
Farmington	36	3
Miles City	20	2
Vernal	18	1
Glenwood Springs	16	1
Meeker	5	0
Newcastle	5	0
Craig	4	0
Milwaukee	4	0

Field office	Number of venting and flaring requests	Percent of overall venting and flaring requests
Roswell	3	0
Grand Junction	2	0
Rawlins	2	0
Rio Puerco	1	0
Total	1281	100 ^b

Data Table for Figure 5: Reasons Cited by Operators to Vent or Flare by Estimated Percentage of Requests to Vent or Flare, Fiscal Year 2014

Reasons	Percentage of request to venting or flaring	Lower bound	Upper bound
Pipeline capacity	39.0%	29.8%	48.2%
Gas plant problem	37.0%	27.9%	46.1%
No infrastructure/awaiting infrastructure	9.0%	4.2%	16.4%
Compressor problem	1.0%	0.0%	5.4%
Gas quality	4.0%	1.1%	9.9%
Unclear	8.0%	3.5%	15.2%
multiple reasons	2.0%	0.2%	7.0%

Data Table for Figure 6: Documentation Provided in Requests to Vent or Flare by Estimated Percentage of Requests to Vent or Flare, Fiscal Year 2014

Documentation provided	Percentage of requests to vent or flare	Lower bound	Upper bound
Economic and geologic justification for long-term venting or flaring	1.0%	0.0%	5.4%
Economic justification only for long-term venting or flaring	6.0%	3.5%	12.5%
Explanation for short-term venting or flaring	3.0%	0.6%	8.5%
None	90.0%	82.4%	95.1%

Data Table for Figure 7: BLM’s Approvals by Estimated Percentage of Requests to Vent or Flare with Royalty Determinations of Approved Requests, Fiscal Year 2014

Request disposition	Percentage of requests to vent or flare	Lower bound	Upper bound
Approved	70.0%	61.3%	78.7%
Denied	3.0%	0.6%	8.5%
Returned	17.0%	10.2%	25.8%
Could not be determined	10.0%	4.9%	17.6%

Approved: Royalty determination	Percentage of approved requests to vent or flare	Lower bound	Upper bound
Royalty-bearing	53.0%	41.6%	64.1%
Royalty-free	47.0%	35.9%	58.4%

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