

July 2009

MINERAL REVENUES

MMS Could Do More to Improve the Accuracy of Key Data Used to Collect and Verify Oil and Gas Royalties



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Highlights

Highlights of [GAO-09-549](#), a report to congressional requesters

Why GAO Did This Study

In fiscal year 2008, the Department of Interior's Minerals Management Service (MMS) collected over \$12 billion in royalties from oil and gas production from federal lands and waters. Companies that produce this oil and gas self-report to MMS data on the amount of oil and gas they produced and sold, the value of this production, and the amount of royalties owed. Since 2004, GAO has noted systemic problems with these data and recommended improvements. GAO is providing: (1) a descriptive update on MMS's key efforts to improve the accuracy of oil and gas royalty data; (2) our assessment of the completeness and reasonableness of fiscal years 2006 and 2007 oil and gas royalty data—the latest data available; and (3) factors identified by oil and gas companies that affect their ability to accurately report royalties owed to the federal government.

What GAO Recommends

To prevent erroneous data from being entered into MMS databases and to check the quality of data already entered, GAO recommends that MMS design (1) an edit check to prevent payors from submitting a claim for processing allowances on gas that is not processed and (2) new edit checks to examine the net effect of adjustments to certain key royalty variables. To simplify auditing, GAO recommends that MMS royalty payors submit data on unit agreements and reasons for changes to original data submissions. In commenting on a draft of this report, Interior generally agreed with our findings and recommendations.

View [GAO-09-549](#) or [key components](#). For more information, contact Frank Rusco, (202) 512-3841, ruscof@gao.gov.

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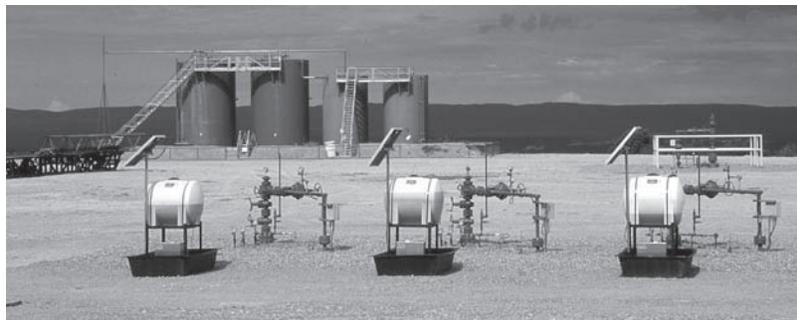
What GAO Found

MMS has several key efforts underway to improve the accuracy of the payor-reported data used to collect and verify royalties, but it is too soon to evaluate their effectiveness. MMS is in the process of implementing (1) GAO's past recommendations to help identify missing royalty reports and monitor payors' changes to royalty data; (2) recommendations from the Royalty Policy Committee—a group empanelled by the Secretary of the Interior to provide advice on managing federal and Indian leases and revenues—to improve edit checks, monitor the quality of natural gas, revise gas valuation regulations, and improve coordination with BLM; and (3) other efforts on adding specific edits for sales prices and identifying discrepancies in volumes between operators and payors.

While much of the royalty data we examined from fiscal years 2006 and 2007 are reasonable, we found significant instances where data were missing or appeared erroneous. For example, we examined gas leases in the Gulf of Mexico and found that, about 5.5 percent of the time, lease operators reported production, but royalty payors did not submit the corresponding royalty reports, potentially resulting in \$117 million in uncollected royalties. We also found that a small percentage of royalty payors reported negative royalty values, which cannot happen, potentially costing \$41 million in uncollected royalties. In addition, payors claimed processing allowances 2.3 percent of the time for unprocessed gas, potentially resulting in \$2 million in uncollected royalties. Furthermore, we found significant instances where payor-provided data on royalties paid and the volume and/or the value of the oil and gas produced appeared erroneous because they were outside of expected ranges.

Oil and gas company representatives reported that several factors affect their ability to accurately report royalties, including complex land ownership, administratively combining leases into units, ambiguity in federal regulations that establish gas prices, short time frames for filing royalty reports, and inaccuracies in MMS's internal databases.

Production Facilities on a Federal Lease in Colorado



Source: GAO.

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Abbreviations

API	American Petroleum Institute
BLM	Bureau of Land Management
Btu	British Thermal Unit
CPT	Compliance Program Tool
EDI	Electronic Data Interchange
FERC	Federal Energy Regulatory Commission
IG	Inspector General
IPAMS	Independent Petroleum Association of Mountain States
IRS	Internal Revenue Service
LLS	Light Louisiana Sweet
MMBtu	millions of British Thermal Units
MMS	Minerals Management Service
OGOR	Oil and Gas Operations Report
PCC	Production Coordination Committee
RIK	Royalty In Kind
RPC	Royalty Policy Committee
TIMS	Technical Information Management System

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United States Government Accountability Office
Washington, DC 20548

July 15, 2009

The Honorable Jeff Bingaman
Chairman
Committee on Energy and Natural Resources
United States Senate

The Honorable Nick J. Rahall, II
Chairman
Committee on Natural Resources
House of Representatives

The Honorable Darrell Issa
Ranking Member
Committee on Oversight and Government Reform
House of Representatives

The Honorable Carolyn Maloney
House of Representatives

Royalties for oil and natural gas produced from federal lands and waters are one of the country's largest non-tax sources of revenue, accounting for over \$12 billion in collections during fiscal year 2008. The Department of the Interior's Minerals Management Service (MMS) is responsible for collecting royalties from companies that produce oil and gas from almost 29,000 federal and Indian leases. Each month, these oil and gas companies self-report to MMS data on the amount of oil and gas they produced and sold, the value of this production, and the amount of royalties owed the federal government. Over the past 5 years, GAO has found problems with these data. These problems include missing data, errors in the self-reported amounts of oil and gas produced, self-reported oil and gas sales value data that, given the reported volumes of oil and gas sold, appear at odds with prevailing market prices for oil and gas, and a lack of controls over changes to the data that companies report. Although data accuracy was not the focus of our previous work, we recommended that MMS correct some of these data.

Building on our prior work examining MMS's royalty data, we are providing (1) a descriptive update of MMS's ongoing efforts to improve the accuracy of oil and gas royalty data, (2) our assessment of the completeness and reasonableness of fiscal years 2006 and 2007 oil and gas royalty data, and (3) factors identified by oil and gas companies that affect

the ability of these oil and gas companies to accurately report royalties owed to the federal government. We are addressing only cash royalty payments; we have a separate engagement underway addressing issues related to MMS's Royalty-in-Kind Program—an option whereby MMS takes a share of oil and gas produced on federal lands and waters in lieu of cash royalty payments.

To describe MMS's efforts to improve the accuracy of royalty data, we reviewed and discussed with MMS officials their action plans to implement recommendations made by GAO and Interior's Royalty Policy Committee, reviewed a demonstration of MMS's Compliance Program Tool (CPT)—an automated system that analyzes royalty payments—and discussed with MMS officials their implementation of the CPT to systemically identify misreported volumes and missing royalty reports. We made no attempt to evaluate the effectiveness of MMS's ongoing efforts to improve the accuracy of royalty data because these efforts are not fully implemented.

To assess the completeness and reasonableness of fiscal years 2006 and 2007 oil and gas royalty data, we first analyzed MMS's existing edit checks and plans for modifying or adding new edit checks. In our subsequent analyses, we replicated several of MMS's edit checks but used a different method. While MMS evaluates each royalty record individually, we combined all royalty records submitted by a given payor for each month, product type, and lease, thereby examining the cumulative effect of changes to original royalty data. We then used our methodology to evaluate 4.1 million royalty records for fiscal years 2006 and 2007 based on extensive data reliability work conducted on two previous assignments. In doing so, we developed a risk-based approach to identify and review key aspects of data collection, processing, and reporting, and reviewed the extent to which MMS's royalty collection system fills those needs. We also reviewed reports and testimonies on oil and gas royalties to understand the historical problems associated with the royalty collection process, and we interviewed key MMS staff and state and tribal auditors that work on federal oil and gas leases to identify any continuing concerns with MMS's royalty reporting process.

To examine factors that oil and gas companies identified as limiting their ability to accurately report royalties owed to the federal government, we interviewed a non-random sample of oil and gas company representatives from the 15 companies that report to MMS the highest amount of royalty data and from the two largest national oil and gas industry associations. The 10 companies that responded to our request for information represent the major companies, large independent companies, mid-size independent

companies, and small independent companies. We chose to interview a non-random sample because we lack the authority to compel private companies to participate in such interviews and because we deemed the cost of trying to convince a large enough sample to participate to make the results statistically relevant to be greater than the benefits of being able to make inferences from the sample interviews. As a result, our results for this objective should not be viewed as a comprehensive list of reporting difficulties or an evaluative assessment of the validity of all the elements of the list. A detailed description of our scope and methodology appears in appendix I.

We conducted this work from July 2008 to April 2009 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

Companies that develop and produce oil and gas resources do so under leases obtained from and administered by the Department of the Interior. Interior's Bureau of Land Management (BLM) manages onshore leases, and Interior's MMS manages offshore leases. MMS is responsible for collecting the royalties on all federal and many Indian oil and gas leases. Royalties on producing leases are a percentage of the value of the production sold less deductions known as allowances.¹ Together, BLM and MMS are responsible for ensuring that oil and gas companies comply with applicable laws, regulations, and policies for more than 29,000 producing

¹Offshore royalty rates for the leases included in the fiscal years 2006 and 2007 royalty data that we examined are typically 12.5 percent or 16.67 percent while onshore royalty rates are typically 12.5 percent or from 12.5 to 25 percent for leases issued before 1988, based on production levels. For certain onshore leases producing heavy oil or oil classified as stripper production—generally low producing leases with higher relative costs—royalty rates may have been less than 12.5 percent for part of fiscal year 2006. Certain amounts of oil produced in the Gulf of Mexico during fiscal years 2006 and 2007 may have been exempt from royalties under provisions of the Outer Continental Shelf Deep Water Royalty Relief Act. Royalty rates for newly issued offshore leases in the Gulf of Mexico were increased twice in 2007 and currently are 18.75 percent, but it is unlikely that any of the 2007 leases we looked at would fall into that royalty category because it typically takes several years at least to develop a lease and begin production.

federal and Indian leases, which account for about 23 percent of domestically produced gas and 26 percent of domestically produced oil.

In some cases, several companies form partnerships to explore and develop oil and gas leases, thereby sharing the risk, the costs, and the benefits. These companies often elect from among themselves a single company, called the operator, to manage the physical drilling of wells and the installation of production equipment. Operators report monthly to MMS on the Oil and Gas Operations Report (OGOR) the amount of oil and gas produced from each well on each lease. In addition, all the companies that share the proceeds from the sale of oil and gas from federal lands and waters are required each month to report to MMS on the Form MMS-2014 data about the oil and gas they sold. MMS refers to these companies, including the operator, as royalty payors. The data on each Form MMS-2014 are then stored in MMS's system as a number of records, each of which consists of many variables, such as the name of the payor, the lease number, the amount of oil and gas sold (sales volume), the value of this oil and gas (sales value), allowable deductions for transportation and processing, and the amount of royalties owed (royalty value). Payors can legally adjust these data they report for up to 6 years if, for example, they learn that the data they submitted were incorrect.² Almost all payors submit these data electronically.

Within its 5-year business plan for fiscal years 2008 to 2012, MMS has set an objective of ensuring timely and more accurate mineral revenue reporting and payment.³ According to Interior's 2009 Budget Justification, MMS set goals in fiscal years 2008 and 2009 of ensuring that companies report 98 percent of their data accurately the first time, up from actual percentages of 97.4 in fiscal year 2006 and 97.3 in fiscal year 2007, and compared to an actual percentage of 98.3 as reported by MMS for fiscal year 2008. While we could not find a business entity that performed identical services to those of MMS for comparing its accuracy of electronic transactions, we chose the Internal Revenue Service (IRS) for comparison because of the potential difficulty in interpreting complex tax regulations, determining allowable deductions, and calculating taxes owed. To this end, IRS reported in January 2008 that its electronic tax filers have a 99

²The Federal Oil and Gas Royalty Simplification and Fairness Act of 1996, Pub. L. No. 104-185, §5(a) (1996), allows payors 6 years to make adjustments to royalty data.

³Five-Year Financial Management Business Plan, FY2008-2012, Department of the Interior, Minerals Management Service, October 2008.

percent accuracy rate—only slightly higher than the rates reported by MMS. To help improve data accuracy, MMS subjects payor-reported royalty data to over 140 edit checks. Specifically, MMS has incorporated certain up-front edit-checks in its data acceptance tools that help detect and reject erroneous payor-reported royalty data before MMS’s data systems will accept them. MMS also incorporates a second level of edit checks that review payor-reported data for additional errors after data are accepted. Edit checks must comply with GAO standards for internal controls in the federal government as required by 31 U.S.C. § 3512(c) and (d), commonly referred to as the Federal Managers’ Financial Integrity Act of 1982. These standards identify and address major performance challenges and areas at greatest risk for fraud, waste, abuse, and mismanagement. Furthermore, the standards state that automated edits and checks should help control the accuracy and completion of transaction processing.

Given the large amount of royalty revenues at stake and problems with royalty management identified by past GAO, Interior Inspector General, and other reports, MMS’s processes for ensuring the accurate collection of royalties have been the subject of continuing scrutiny. For example, in 2003 while examining MMS’s Royalty-in-Kind program, we found that from 1.9 percent to 3.3 percent of the data that we examined for oil leases in Wyoming and the Gulf of Mexico were erroneous or missing, and that 6 percent of the data that we examined for gas leases in the Gulf of Mexico were anomalous, meaning that data values fell outside of expected ranges.⁴ Similarly in 2004, we found that 40 percent of the royalty data that we examined for 10 geothermal projects was either missing or erroneous.⁵ In 2006, we examined the relationship between the increases in oil and gas prices from 2000 to 2005 and the amount of royalties collected during that time and found that 8.5 percent of the data appeared anomalous.⁶ In 2008, we reported that MMS’s royalty management system lacked several capabilities that would provide greater assurance that royalties are

⁴GAO, *Mineral Revenues: Cost and Revenue Information Needed to Compare Different Approaches for Collecting Federal Oil and Gas Royalties*, [GAO-04-448](#) (Washington, D.C.: Apr. 16, 2004).

⁵GAO, *Renewable Energy: Increased Geothermal Development Will Depend on Overcoming Many Challenges*, [GAO-06-629](#) (Washington, D.C.: May 24, 2006).

⁶GAO, *Royalty Revenues: Total Revenues Have Not Increased at the Same Pace as Rising Oil and Natural Gas Prices due to Decreasing Production Sold*, [GAO-06-786R](#) (Washington, D.C.: June 21, 2006).

collected accurately.⁷ These capabilities include readily identifying changes that companies make to previously entered data, detecting the absence of royalty reports, and implementing a process for collecting the proper amount of royalties when MMS identifies that oil and gas volumes have been incorrectly reported. Among other things, we recommended MMS identify when royalty reports have not been filed as required and when companies make changes to data provided to MMS after the statutory limitation on such changes. We also reported that MMS was taking steps to address these deficiencies.

In addition to GAO's work, Interior's Inspector General (IG) analyzed MMS's auditing and compliance process and made several recommendations in 2007 to improve these functions and the systems that track them. Also, the Royalty Policy Committee (RPC)—a group empanelled by the Secretary of the Interior and charged with providing advice on managing federal and Indian leases and revenues—has identified numerous deficiencies. In December 2007, the RPC issued a report that included more than 100 recommendations to strengthen Interior's royalty collections by improving BLM's and MMS's verification of production volumes, improving many areas of MMS's audit and compliance efforts by establishing a compliance strategy counsel, improving coordination between MMS and BLM, and improving MMS's computer system.

⁷GAO, *Mineral Revenues: Data Management Problems and Reliance on Self-Reported Data for Compliance Efforts Put MMS Royalty Collections at Risk*, [GAO-08-893R](#) (Washington, D.C.: Sept. 12, 2008).

MMS Has Ongoing Efforts to Improve the Accuracy of Payor-Reported Royalty Data, but It Is Too Early to Assess the Effectiveness of These Efforts

MMS has three major efforts underway to improve the accuracy of payor-reported royalty data used to collect and verify royalties, but it is too early to evaluate the effectiveness of these efforts. First, MMS is beginning to address GAO's recommendations concerning the identification of missing royalty reports and the monitoring of adjustments that companies make to their royalty data.⁸ Second, MMS is implementing RPC recommendations concerning edit checks, valuation regulations for natural gas, and coordination with BLM. Third, MMS is continuing to develop processes to increase the accuracy of royalty reporting data by improving edit checks on oil and gas sales prices and using the CPT to identify errors in the amount of oil and gas reportedly sold by payors.

MMS Is Beginning to Address GAO's Recommendations, but It Is Too Early to Assess the Effectiveness of These Actions

To address a past GAO recommendation, MMS is developing a process to automatically detect within 6 months those cases in which a company has not filed a royalty report when it has filed a production report. MMS officials explained that 6 months is a reasonable timeframe, and that companies make most corrections to missing or incorrect royalty data within this time frame. Under the current royalty reporting system, cases in which a company has not filed a royalty report may not be detected until more than 2 years after the initial reporting date, when MMS personnel in their compliance group begin to target leases for a review or audit. According to MMS officials, personnel in the financial management group are beginning to identify missing royalty reports by identifying instances in which the royalty report—the Form MMS-2014—is absent when a production report—the OGOR—was filed by the operator. With few exceptions, MMS should receive corresponding royalty reports for each production report it receives. MMS has additional checks in place through its CPT for determining when both the OGOR and the Form MMS-2014 are missing.

Also in response to a GAO recommendation, MMS is developing an automated process to identify changes that royalty payors make to their previously entered royalty data that exceed the 6-year statutory limit on such adjustments or that occur after compliance work, including audits, has been completed. Although these adjustments may change payors' royalty payments, prior to this effort MMS's royalty reporting system could

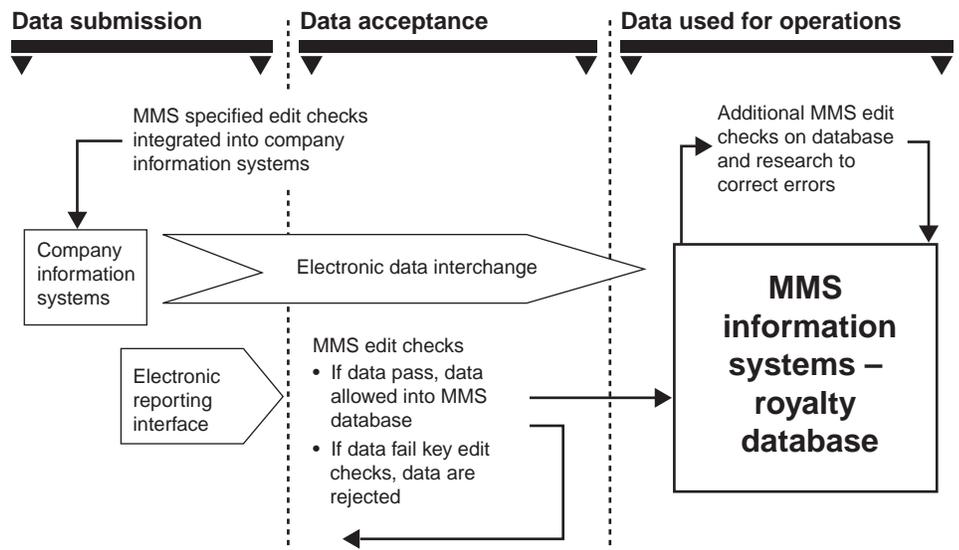
⁸GAO, *Mineral Revenues: Data Management Problems and Reliance on Self-Reported Data for Compliance Efforts Put MMS Royalty Collections at Risk*, [GAO-08-893R](#) (Washington, D.C.: Sept. 12, 2008).

not monitor them and payors could continue to adjust their previously reported royalty data without prior MMS approval or review. In addition, companies could change royalty data after an audit has been completed, and MMS needs to be able to identify when this occurs, as we have suggested in our previous work. While adjustments may occur for legitimate reasons, and identifying them will not prevent them from occurring, it could facilitate later scrutiny and follow up with company officials. However, it is too early to evaluate the effectiveness of these actions.

MMS Has Developed Plans to Address RPC Recommendations, but More Progress Is Needed before Results Can Be Evaluated

MMS is implementing action plans to address royalty reporting issues raised by the 2007 RPC Report. The following actions directly relate to four recommendations for improving the accuracy of the royalty reporting process out of over 100 recommendations identified by the RPC. First, MMS is in the process of using its existing edit checks and adding additional edit checks to examine more data before the data are entered into its database, instead of examining data that have already been accepted and stored. Specifically, this change will affect royalty data that payors submit through the electronic reporting interface—a Web site-based portal through which MMS accepts almost 30 percent of its data. According to MMS officials, the other 70 percent of royalty records are accepted through the Electronic Data Interchange (EDI)—a standardized method of transferring data electronically between computer systems, such as a payor’s system and MMS’s system. Currently, there are some edit checks built into the EDI software, but MMS’s goal, as outlined in its strategic business plan for 2008-2012, is to require EDI reporters to implement most edits on their individual computer systems before they submit the data through EDI. If they do not, then payors must use MMS’s other system for submitting data—the electronic reporting interface—which accepts fewer royalty records at a time, but already has these up-front edit checks built into its system. As GAO has noted in prior reports, edit checks that prevent potentially erroneous data from entering the databases offer advantages over efforts to continually clean up erroneous data allowed into the system. However, it is too early to tell how useful these specific efforts will be. MMS’s processes for checking data are outlined in figure 1.

Figure 1: MMS's Processes for Submitting, Checking, and Accepting Royalty Data



Source: GAO.

Note: Not all data are submitted electronically. Less than 1 percent is submitted in paper format and are keypunched and loaded into the database, where they are subjected to edit checks. All data submitted through the electronic reporting interface that fail edit checks are not rejected. Some data with errors that MMS considers less important are accepted by the database.

Second, MMS is working on a problem identified by the RPC concerning the accuracy of reporting natural gas royalties. The RPC recommended that MMS add a data field on the Form MMS-2014 that identifies the heat content per cubic foot of natural gas, which is important in determining the amount of royalties owed. State and tribal royalty auditors with whom we spoke also identified the need to check on the heat content of natural gas. In response to the RPC recommendation, MMS officials said that they developed and recently implemented an alternate plan for evaluating the information identified by the RPC using data already collected on the Form MMS-2014 and maintained in its databases. In particular, payors report to MMS the quantity of natural gas sold (in thousands of cubic feet) as well as the total heating value of all the gas sold (in millions of Btus, an industry standard for selling natural gas). MMS officials told us they plan to calculate the heating value per cubic foot from these existing data fields, by dividing the total heating value by the quantity sold, and implement an edit check on the reasonableness of the results of this

calculation.⁹ Moreover, MMS officials said that it was too costly to change the structure of its database to accommodate a new data field and modify how data are collected. We believe that MMS's alternative is a reasonable approach and that it is likely to identify errors in reported gas volumes.

Third, MMS is planning to publish proposed revisions to its gas valuation regulations and guidelines that they believe will address several problems. For example, MMS regulations provide a series of benchmarks for companies to use in establishing the price of natural gas when they sell it to their affiliates. However, according to the RPC and state auditors, these benchmarks are difficult to apply and do not reflect how gas is currently sold so they recommend that MMS should replace these benchmarks with widely published market indexes. Another problem that MMS intends to address with its new gas valuation regulations relates to how companies can take deductions from gas revenues. According to MMS regulations, the costs for transportation and processing must be properly allocated among the individual products that result from the processing of gas. However, gas purchasers can "bundle" all of these charges together, making it difficult for the payor to determine how to allocate these deductions and then to calculate what is actually owed in royalties. While MMS has plans to address these and other issues with its new regulations, they were unable to give us sufficient details about how this would be done for us to evaluate the effectiveness of the new regulations. MMS has a target date for completion of the new proposed regulations of December 2009.

Fourth, in response to RPC recommendations that MMS improve its interagency coordination with BLM, MMS has taken a first step to improve coordination. Specifically, the RPC recommended that the Department of the Interior establish a Production Coordination Committee (PCC) that is charged with, among others things, defining and coordinating common processes, defining common data standards, and addressing technical issues for information sharing between the two agencies. To begin this process, MMS, BLM, and the Bureau of Indian Affairs held a 3-day PCC meeting in September 2008, during which a number of key issues regarding the accuracy of royalty data were discussed, including (1) placing more responsibility on industry to provide clean data to MMS; (2) resolving invalid lease numbers; (3) sharing information on rents,

⁹Sales volumes for gas on the Form MMS-2014 are actually listed in thousands of cubic feet (mcf). The industry standard for selling natural gas is known as MMBtu and refers to millions of Btus, which is equal to thousands of cubic feet times the heating value of a cubic foot of gas expressed in Btus.

agreements, and Indian leases in a more timely manner; and (4) providing notices to MMS when wells first start to produce. This meeting was a first step in improving inter-agency coordination, but it is too early to judge the effectiveness of the committee. MMS officials said that additional meetings are planned on a recurring basis.

MMS Has Other Efforts Underway to Improve the Quality of Payor-Reported Royalty Data, but Their Preliminary Nature Precludes Assessing Their Effectiveness

MMS officials told us they are evaluating a process to incorporate more detailed market prices into its system to compare sales prices that MMS calculates from payor-reported royalty data to relevant market prices. MMS does not require payors to report their sales prices but can calculate an implicit sales price by dividing the total value of the oil or gas that payors report (sales value) by the volume that payors report as having sold (sales volume). Currently, MMS uses for comparison a few oil and gas prices with a wide range of values for all leases regardless of where the lease is located or the quality of oil that is produced. MMS officials told us that they intend to incorporate a more detailed price table into its royalty reporting system by 2010 that will include more specific sales prices related to geographic areas and specific sales months. We believe that this could be a significant improvement, but it remains too early to assess MMS's efforts.

In addition, during the course of our work, MMS officials told us they plan to expand the implementation of two edit checks. First, MMS plans to expand the use of an edit check that will calculate the royalty rate from payor-reported data and compare this with the royalty rate specified in each lease. As with sales prices, MMS does not require payors to report royalty rates but can calculate implicit royalty rates from payor-reported data. MMS can calculate implicit royalty rates by dividing the amount of royalties that payors report (royalty value) by the total value of the oil or gas that payors report (sales value). While MMS has checked royalty rates on Indian leases and prevented erroneous data on these leases from entering its system since prior to 2001, MMS's checking of royalty rates has not prevented erroneous data on federal leases from entering its system. However, MMS plans to resolve this issue on federal leases by the end of fiscal year 2009. Second, MMS recently began using an edit check that ensures payors take processing allowances only on gas that is processed. MMS reported that in April 2009 it implemented such an edit check in its electronic reporting interface. This action will affect about 30 percent of data entering MMS's system, but will not impact potentially erroneous data that companies submit through the EDI. We believe that expanding the use of both of these edit checks can improve MMS's ability to evaluate self-reported royalty data, but we will be unable to evaluate the effectiveness of these new processes until they are fully implemented.

In 2008, MMS auditors in its compliance group began to use the CPT to identify discrepancies—based on certain thresholds—between the volumes of oil and gas produced that lease operators reported on the OGOR and the total volumes sold that payors reported on the Form MMS-2014.¹⁰ When conducting this process, MMS also is able to identify instances when a royalty payor fails to submit the required Form MMS-2014. However until recently, these comparisons are not done until over 2 years after royalty data have been submitted when MMS begins to select leases for audit. While this volumetric comparison had been done much sooner and routinely for all leases in the past, the process was dropped when MMS implemented its current information system in 2001 because the new module that was to perform this function was not yet ready for implementation and because MMS wanted to expand the comparison to include an examination of the amount of royalties paid and the value of the oil and gas sold. MMS officials explained that under the old system, potential mismatches between OGOR and 2014 volumes often involved errors in the royalties paid and/or the value of the oil and gas sold, and it was important to look at all three of these components at once. They further explained that the new module was never implemented but instead was replaced with an expanded use of the CPT, albeit at a much later date than initially anticipated. MMS reported that in January 2009, it began using the CPT to compare volumes and examine the amount of royalties paid and the value of the oil and gas sold within 6 to 9 months after payors submit data. Moreover, in 1992 when we last examined the comparison of volumes on the OGOR with volumes on the Form MMS-2014, we determined that it was cost effective to follow up on at least the largest of the discrepancies and support MMS doing this within an earlier time frame, such as 6 months after receiving royalty data.

In Several Instances, Data Used to Collect and Verify Royalties Are Either Missing or Appear to Be Erroneous

While much of the royalty data we examined from fiscal years 2006 and 2007 appears reasonable, we found several instances where key data were missing or appear to be erroneous. For example, our close examination of producing gas leases in the Gulf of Mexico indicated that up to 5.5 percent of the time, royalty reports were missing for these leases. We also found that from about 2 to 7.4 percent of the time, depending on the group of leases we examined, either the amount of royalties that payors report due (royalty value) and/or the total value of the oil and gas that payors report (sales value) appeared erroneous. In addition, 3.9 percent of sales values

¹⁰MMS considers the precise thresholds used to be a confidential element in its oversight.

and/or the volume that payors report as having sold (sales volume) from offshore oil leases in the Gulf of Mexico appeared erroneous while about 6.6 percent of one or both of these data elements appeared erroneous for offshore gas leases in the Gulf of Mexico.

Checks for Completeness of Payor-Reported Royalty Data Indicate That Certain Data Are Missing

Our detailed examination of producing gas leases in the Gulf of Mexico indicated that 5.5 percent of royalty reports were missing. Using production reports filed by lease operators, we identified all leases producing gas in the Gulf from January 2006 through September 2007.¹¹ For each month in which operators reported gas production, we checked MMS's monthly royalty reports to ensure that payors reported sales of gas.¹² We found that about 5.5 percent of the time that operators reported monthly gas production from leases, payors did not submit the corresponding monthly royalty report. The missing royalty reports for this production represent potentially about \$117 million in royalties that may not have been collected.¹³ However, it is possible that instead of reporting royalties on the appropriate reports, payors may have misreported these

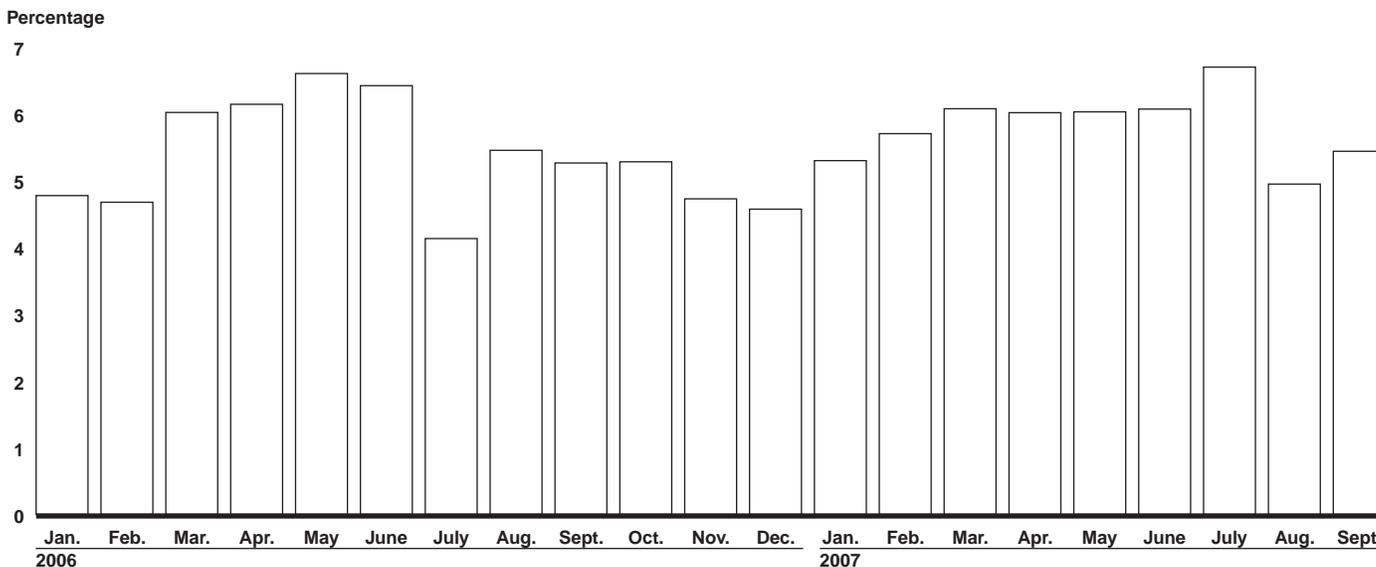
¹¹We excluded October through December 2005 because major hurricanes disrupted production.

¹²We did not include all leases in our analysis because we found it difficult to directly match the operator-reported data with the payor-reported data for all 29,000 producing federal and Indian leases. Many leases, particularly those located onshore, may belong to one or more units. Operators may report production volumes either by unit or by individual lease, but royalty payors must report royalties by lease and indicate on their royalty report if the lease belongs to a unit, but it is common for royalty reporters not to identify the unit, creating possibilities for mismatching the operator-reported and payor-reported data. Furthermore, we found MMS's published lists identifying the leases that belong to units to be incomplete. As such, we used MMS's Technical Information Management System (TIMS) database, which appears to be complete but contains data only for offshore leases, to identify offshore leases within federal units. We then excluded all onshore leases and the offshore lease belonging to units. We also excluded offshore oil production because oil, unlike gas, can be held in storage tanks before being sold, and MMS officials said that there are problems with the volumes reportedly sold from some of these storage tanks. Our resulting sample of offshore gas leases numbers about 1,500. Because we did not evaluate all federal and Indian leases, or even random samples of all the various types of leases—onshore and offshore, oil and gas, large and small, for example—the results of this analysis cannot be extrapolated to the entire universe of federal and Indian leases. However, offshore gas leases account for a significant amount of gas production from all federal leases.

¹³This estimate is based on the production volumes reported on the OGORs, an average Gulf of Mexico royalty rate of 14.7 percent for gas in fiscal years 2006 and 2007 after allowances, and the average monthly spot prices per MMBtu at the Henry Hub—a major gas-trading center—during the month royalty reports were missing.

royalties on reports for other leases, and as such, additional royalties would not be due. We also observed instances in which the total gas production on the royalty reports was substantially less than that on the production reports, possibly indicating that one of multiple payors on that lease may not have submitted a royalty report for that month. While a significant number of the almost 1,500 leases in our sample had royalty reports but no production reports, missing production reports were more prevalent for the last 3 months of fiscal year 2007, possibly indicating that these reports had not yet been received or accepted by MMS's system. Missing royalty reports are illustrated in figure 2.

Figure 2: Percentage of Gas Production Reports without Corresponding Royalty Reports in the Offshore Gulf of Mexico for Fiscal Years 2006 and 2007



Source: GAO analysis of MMS data.

Checks for Reasonableness of Payor-Reported Royalty Data Indicate Errors in Transportation and Processing Allowances

We evaluated all royalty data for fiscal years 2006 and 2007—excluding royalty-in-kind leases—for obvious errors in key reported royalty variables, including volumes of oil and gas sold, the value of this oil and gas, and royalties paid, and found that the error rate for these variables ranged from 0 percent to about 2.3 percent, with the highest levels of errors being found in transportation and processing allowances. This analysis is summarized in table 1, along with subsequent analyses discussed below. We used a different method than MMS's edit checks to evaluate the reasonableness of royalty data. For example, MMS's edit checks generally evaluate each royalty record individually, and a royalty

payor may submit multiple records for a given lease each month, including the original royalty report and often times multiple corrections to the volumes sold or the royalties paid. However, we combined all royalty records associated with a given payor for each month, product type, and lease. Unlike MMS's edit checks of individual royalty records, our methodology is able to detect if adjustments exceed the amount of the original entries. For example, in checking the sum of the sales values, sum of sales volumes, and sum of royalty values that payors submitted for a given month, product type, and lease, we found that over 99.8 percent of the time these sums were positive, as one would expect when payors owe royalties.¹⁴ However, payors submit one payment per month for all their federal leases; therefore a negative royalty value for an individual lease may go undetected if it is small in comparison to the sum of the royalty values for all their other leases. Although the 0.2 percent of royalty values that we found to be negative is a small percentage, collectively this represented about \$41 million in royalties that may not be collected if these instances are not detected in future compliance work or audits. Further, a check for positive royalty values is not a precise measure of accuracy. Rather, it is a gross check of reasonableness and some positive royalty rates, which we did not evaluate, could have been lower than they were supposed to be.

We found that transportation allowances and processing allowances, which should always be negative values in the database, were positive 1.73 percent and 0.77 percent of the time, respectively. We also found that about 2.3 percent of claimed processing allowances were incorrect. These processing allowances were associated with either unprocessed gas, which by definition is not entitled to a processing allowance, or coalbed methane, which is never processed, and therefore should not receive an allowance. Claiming processing allowances for gas that was not processed could result in MMS collecting about \$2 million less in royalties than are due for the fiscal year 2006 and 2007 leases that we examined. However, the gas reported as unprocessed gas could be processed gas that was improperly reported as unprocessed gas by the payors, and hence, no additional royalties would be due. Either way, there are reporting errors

¹⁴When we report on royalty data, such as sales volumes, we sum all sales volumes that an individual payor reports on each lease for each product code during each sales month. For example, if one company reports 100 barrels of oil sold from a lease during December and its partner reports 3 barrels of oil sold from the same lease during the same month, we have 2 sales volumes. We would then calculate the percentage of these two sales volumes that are positive—either 0, 50, or 100 percent.

that raise questions about the accuracy of royalty collections. In addition, we checked that transportation and processing allowances did not exceed regulatory limits and found that they were within limits nearly 100 percent of the time. Lastly, we checked and verified that payors did not report sales volumes when reporting transportation and processing allowances separately from royalty amounts. This is not permitted because the reporting of sales volumes in this situation would lead to reporting the volumes sold twice. Table 1 summarizes the types of errors for which we checked and the percent of times they occurred.

Table 1: GAO Analysis of Key Royalty Variables, MMS’s Oil and Gas Royalty Data Exclusive of Royalty-in-Kind Transactions, Fiscal Years 2006 and 2007

Definition of possible error associated with key royalty variables	Percent error rate found
Reporting sales volume when reporting allowances separately from royalties due	0
Exceeding the regulatory limit for processing allowances ^a	0.02
Exceeding the regulatory limit for transportation allowances ^a	0.06
Reporting negative sales volume	0.12
Reporting negative sales values	0.20
Reporting negative royalty values	0.20
Reporting positive processing allowances	0.77
Reporting positive transportation allowances	1.73
Claiming processing allowance for unprocessed gas or coalbed methane	2.29

Source: GAO analysis of MMS data.

^aPayors can exceed the regulatory limit with prior approval from MMS.

Significant Amounts of Payor-Reported Data Appear Erroneous as Indicated by Implicit Royalty Rates

We found that, of the key royalty variables self-reported by royalty payors, either the royalties owed, the value of the oil or gas sold, or both, appeared erroneous from 2 to 7.4 percent of the time, depending on the group of leases that we examined. MMS’s royalty system does not require payors to report royalty rates but rather the amount of their royalty payment—royalty value—and the total amount they received for the sale of oil or gas from each federal lease—sales value. We calculated an implicit royalty rate by dividing royalty value by sales value and compared this number to royalty rates generally specified in federal leases. Because payors are not required to report the royalty rate that applies to each individual lease and data were not readily available to us, it was time prohibitive to individually compare each calculation to the royalty rate specified in the lease. Instead,

we compared the calculated rates to general lease terms, allowing for significant but common departures from these terms.

We found that either royalty values or sales values, or both, were erroneous about 2.2 percent of the time for offshore oil leases and about 2 percent of the time for offshore gas leases when we calculated implicit royalty rates with fiscal year 2006 and 2007 data. We compared our implicit royalty rates with standard offshore lease terms of either 12.5 percent or 16.67 percent, allowing for some rounding error in these rates. Our analysis did not identify as erroneous those instances when the calculated royalty rate was 12.5 percent, but the lease royalty rate was actually 16.67 percent, or vice versa. We also compared leases for which the calculated implicit royalty rates were other than 12.5 or 16.67 percent to actual royalty rates as specified in the federal lease and adjusted our analysis for those few times when these calculated, but apparently erroneous royalty rates, were legitimate. As such, a royalty rate that is different from general lease terms means that either the payor-reported royalty value or the sales value is erroneous. MMS acknowledged that erroneous royalty rates could result from payors misreporting the sales value or the royalty value owed to the federal government.

We found that either royalty values, sales values, or both, appeared erroneous about 7.4 percent of the time for onshore oil leases and about 4.8 percent of the time for onshore gas leases when we calculated implicit royalty rates with fiscal year 2006 and 2007 data.¹⁵ We compared our implicit royalty rates with standard onshore oil and gas lease terms of either 12.5 percent or a variable royalty rate schedule that depended on production volumes for certain leases issued before 1988. These variable rates ranged from 12.5 percent to 25 percent for oil production and were either 12.5 percent or 16.67 percent for gas production. We also assumed royalty rates of 5 and 10 percent as being correct because MMS indicated that these were common royalty rates on certain older leases, and we verified this by examining a sample of leases. We excluded all oil leases

¹⁵We could not compare our calculated implicit onshore royalty rates with the actual royalty rates established in the lease terms because the latter data were not readily available to us. However, we examined a sample and found few onshore leases that departed from the royalty rate ranges we used for comparison. Because of the wide range of onshore royalty rates that we used, we believe that this is a conservative approach. Nevertheless, because of the possibility that a calculated royalty rate that is different from general onshore lease terms can be legitimate, we refer to the royalty values or the sales values for onshore leases in this situation as appearing erroneous, rather than being erroneous.

prior to February 2006 because royalty rates below 12.5 percent were in effect during that time for low volume or heavy oil production. Our analysis did not identify as erroneous those instances when the implicit royalty rate matched standard royalty rates but was nevertheless incorrect. In addition to misreporting royalty values or sales values, MMS said that the higher percentage of apparently erroneous royalty data for onshore oil leases may be due to royalty payors continuing to incorrectly pay royalties under expired provisions for low volume or heavy oil. Erroneous royalty rates are summarized in table 2.

Table 2: Royalty Rate Calculations Outside of Expected Ranges for Federal Oil and Gas Leases, Fiscal Years 2006 and 2007

Type of lease	Apparent error rate (percent)
Offshore oil	2.2
Offshore gas	2.0
Onshore oil	7.4
Onshore gas	4.8

Source: GAO analysis of MMS data.

Significant Amounts of Payor-Reported Data Appear Erroneous as Indicated by Implicit Sales Prices in the Gulf of Mexico

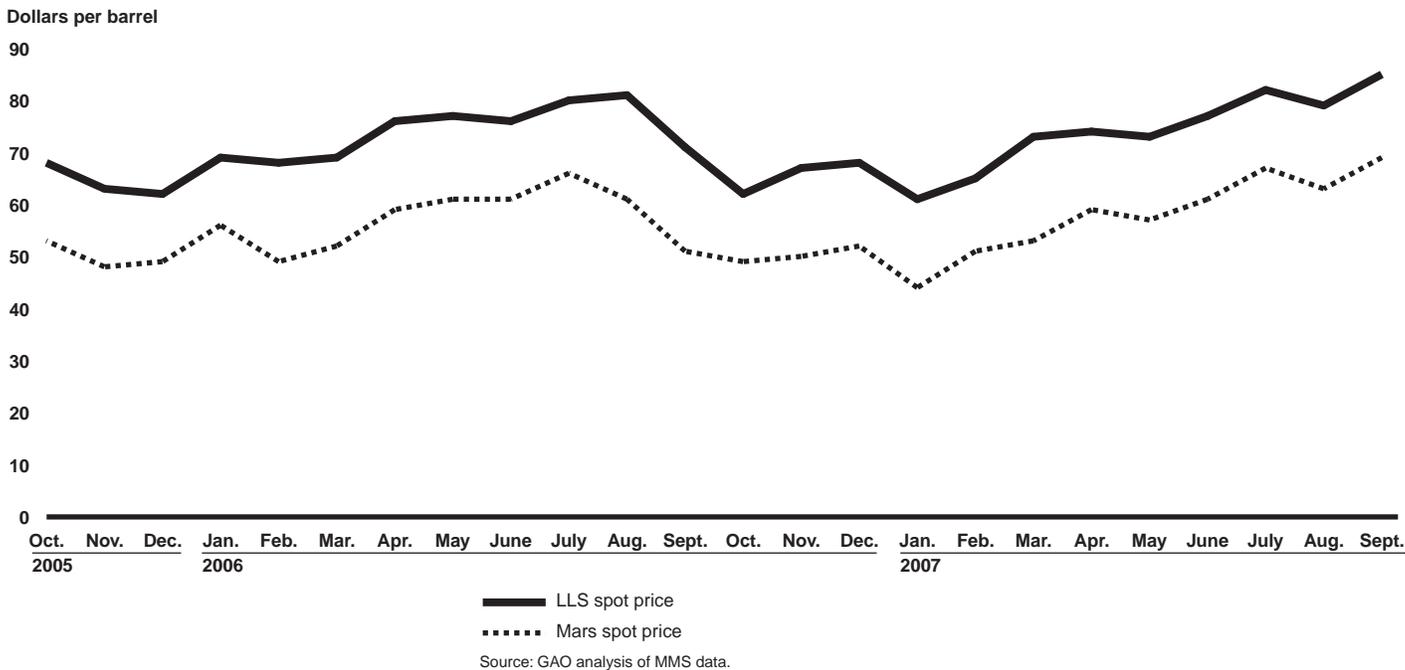
We found that either sales values or sales volumes appeared erroneous about 3.9 to 6.6 percent of the time we used fiscal year 2006 and 2007 royalty data to calculate implicit sales prices in the offshore Gulf of Mexico.¹⁶ MMS does not require payors to report oil and gas sales prices (prices per unit sold) but instead requires payors to report the total amount they received for the sale of oil or gas from a federal lease—sales value—and the total volume of oil or gas that they sold—sales volume. We calculated an implicit sales price per unit by dividing sales value by sales volume and compared this number to prevailing market prices at the time.¹⁷

¹⁶We refer to these sales values or sales volumes as appearing erroneous rather than being erroneous because there could be legitimate reasons for these prices being outside of expected ranges.

¹⁷We reviewed sales in the offshore Gulf of Mexico because of the readily available transparent markets there, as opposed to the many different markets onshore that complicate the valuation of oil and gas. As in our analyses of sales volumes, sales values, royalty values, and transportation and processing allowances, we combined all royalty records submitted by a given payor for each month, product type, and lease.

For offshore oil in the Gulf of Mexico, we found that our implicit sales prices fell outside of a wide range of prevailing market prices 3.9 percent of the time during fiscal years 2006 and 2007. We used a range of market prices each month for comparison, the low price being the lowest daily spot price that month for Mars oil—a low quality, low value oil produced in the offshore Gulf—and the high price being the highest daily spot price for light Louisiana sweet (LLS)—a high quality, high value oil. The average difference between these prices was about \$16 per barrel of oil during the October 2005 through September 2007 period we evaluated. We believe that this is a conservative approach because the two prices are among the lowest and highest prices that we found in the Gulf of Mexico. Therefore, while there may be cases in which prices fall outside of this range for legitimate reasons, we would expect this to be a rare occurrence. Conversely, prices that fall within this range are reasonable but not necessarily correct. This price range is illustrated in figure 3.

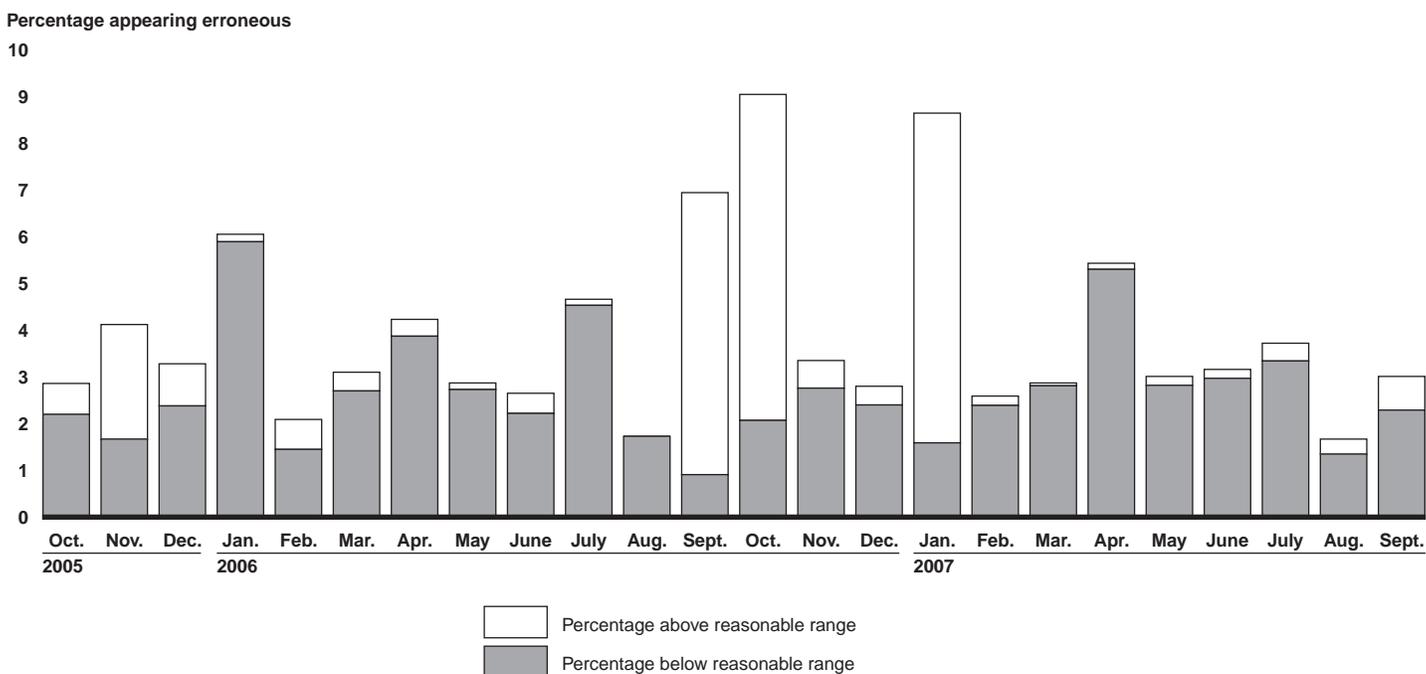
Figure 3: Range of Reasonable Oil Prices in the Offshore Gulf of Mexico Based on Highest and Lowest Daily Spot Prices for Each Month



In addition to possible errors in reported sales values or sales volumes, MMS officials said that low oil prices may reflect poor marketing, sales of low quantities of poor quality oil that settle in storage tanks, or sales of oil at offshore platforms where the sales price may be discounted for

transportation. MMS officials also said that royalty payors may also be netting the cost of transportation from their sales value, which is against MMS regulations. On the other hand, high oil prices may reflect good marketing. Figure 4 depicts the percentage of our calculated oil prices that appeared erroneous and distinguishes between when the prices fell below or above the expected range.

Figure 4: Sales Prices for Oil from Federal Leases in the Offshore Gulf of Mexico That Appear Erroneous, Fiscal Years 2006 and 2007

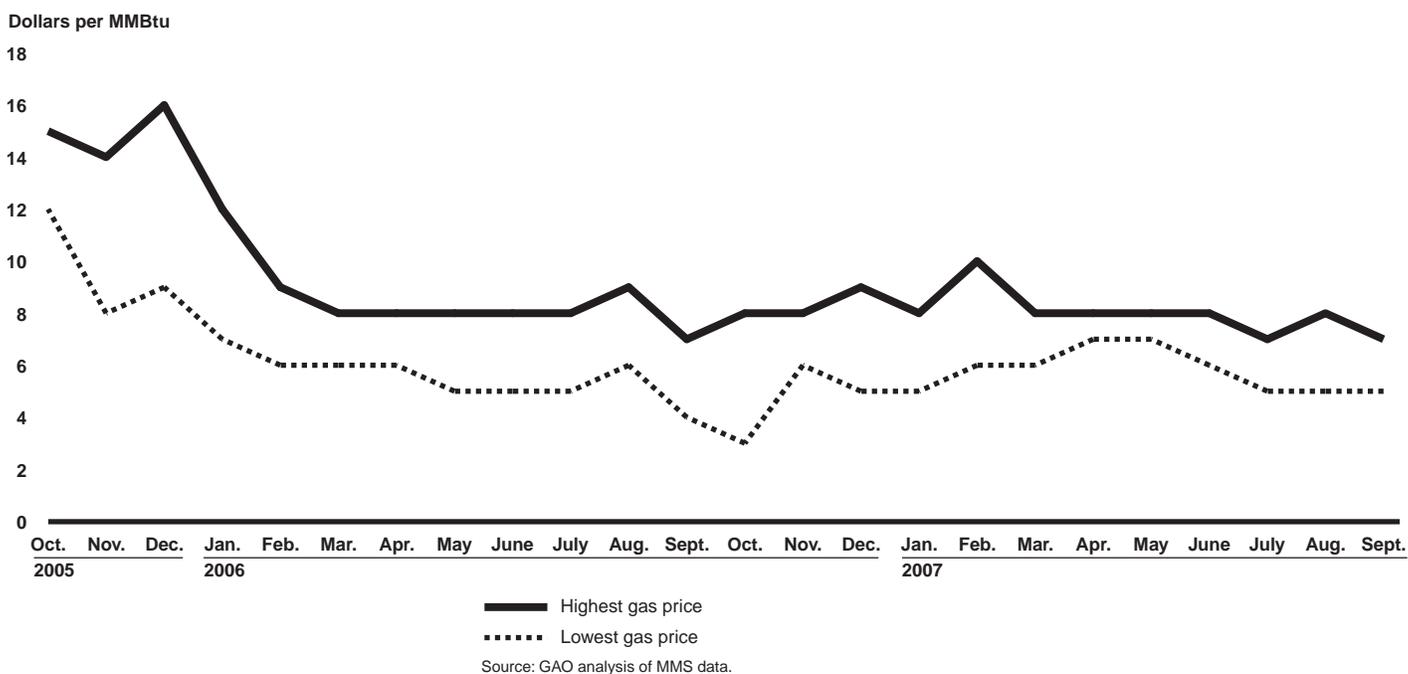


Source: GAO analysis of MMS data.

For gas produced offshore in the Gulf of Mexico, we found that our calculated implicit sales prices fell outside of the range of prevailing market prices 6.6 percent of the time. We used a range of market prices at the Henry Hub—a major gas trading center in the Gulf of Mexico—each month for comparison. To establish a low and a high price, we examined three specific prices each month and chose the highest and the lowest price from among the three. These three prices are the maximum mid-day spot price during that month, the minimum mid-day spot price during that

month, and the First of the Month price.¹⁸ All three prices are common prices upon which producers sell their gas in the Gulf of Mexico, according to MMS, and we believe this is a conservative approach. The average difference between the highest and the lowest prices was about \$3 per MMBtu during the period October 2005 through September 2007. These prices are illustrated in figure 5.

Figure 5: Range of Reasonable Gas Prices in the Gulf of Mexico Based on Highest and Lowest Daily Spot Prices for Each Month and the First of the Month Price at the Henry Hub

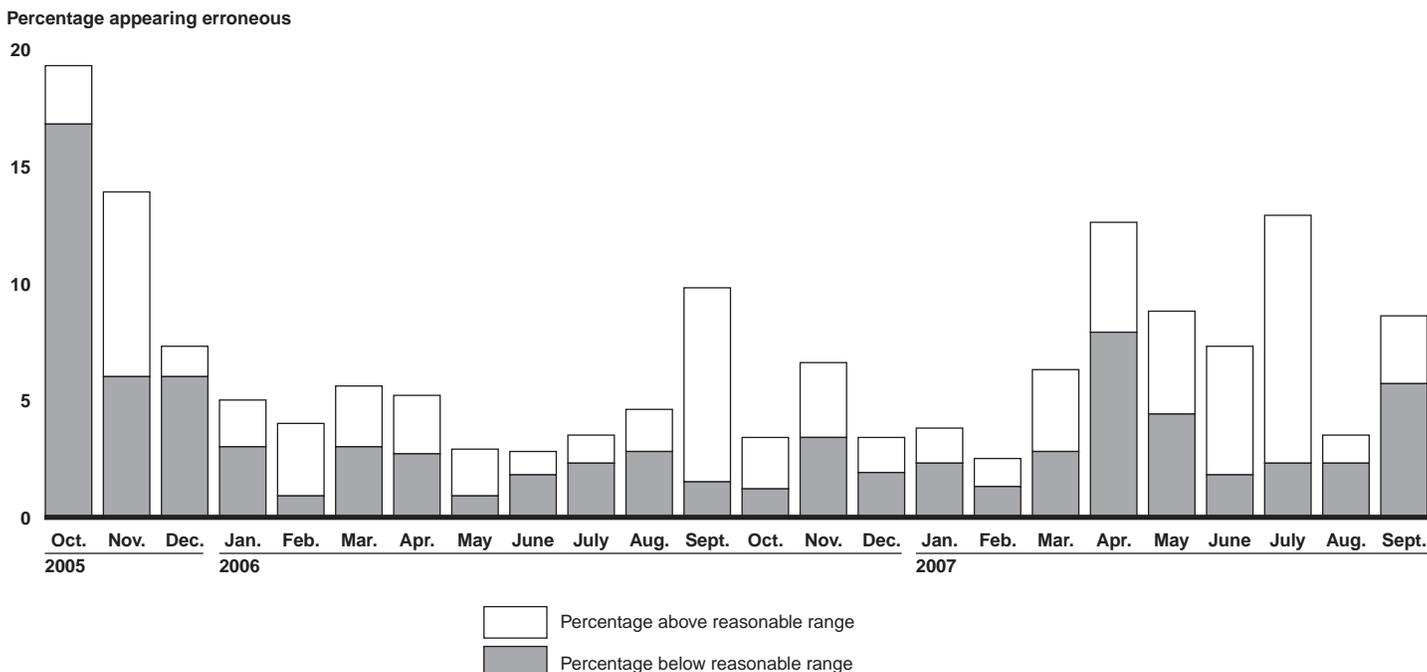


As with oil prices, being outside of the range does not necessarily mean that the price is erroneous, but we would not expect this to be a common occurrence. Conversely, being within this range means that the sales price is reasonable but not necessarily correct. In addition to possible errors in reported sales values or sales volumes, MMS officials said that low or high prices can reflect marketing efforts. Quality does not affect calculated prices because gas quality is standardized by reporting sales prices per MMBtu. The percentage that our calculated gas prices appeared erroneous

¹⁸First of the Month is a price that is published on the first day of the month in the publication entitled Inside FERC's Gas Marketing Report.

is depicted in figure 6, distinguishing between implicit prices that fell below and above the expected range.

Figure 6: Sales Prices for Gas from Federal Leases in the Offshore Gulf of Mexico That Appear Erroneous, Fiscal Years 2006 and 2007



Source: GAO analysis of MMS data.

Multiple Factors Affect Oil and Gas Companies' Abilities to Accurately Report Royalties Owed to the Federal Government

Oil and gas company representatives reported that several factors can affect their ability to accurately report royalty data, including complex land ownership patterns, unit agreements, ambiguity in federal regulations, short time frames for filing royalty reports, and inaccuracies in MMS's internal databases.

**Complexity of Ownership
Can Make Accurate
Reporting of Oil and Gas
Royalties More Difficult**

The complexity of unit agreements (units) can impact the accuracy of royalty data. Upon the request of companies, BLM and MMS can administratively combine contiguous leases into units to more efficiently explore and develop an oil or gas reservoir and to lessen the surface disruption caused by the building of roads and the installation of pipelines and production equipment. MMS requires payors to report royalties for each producing lease and, if a lease is assigned to a unit, to provide information identifying the unit in the agreement data field. If a lease does not belong to a unit, the agreement data field should be left blank. However, companies can fail to complete the agreement data field when a lease belongs to a unit, which raises questions about whether the royalties paid were for production belonging to a unit or for production outside of a unit. This complicates the auditing of the royalty data. Figure 7 shows how federal leases can be combined into a federal unit to explore for oil and gas, and figure 8 illustrate the complexity of auditing these leases when a payor fails to complete the agreement field.

Figure 7: Block Diagram Illustrating the Hypothetical Creation of a Federal Unit

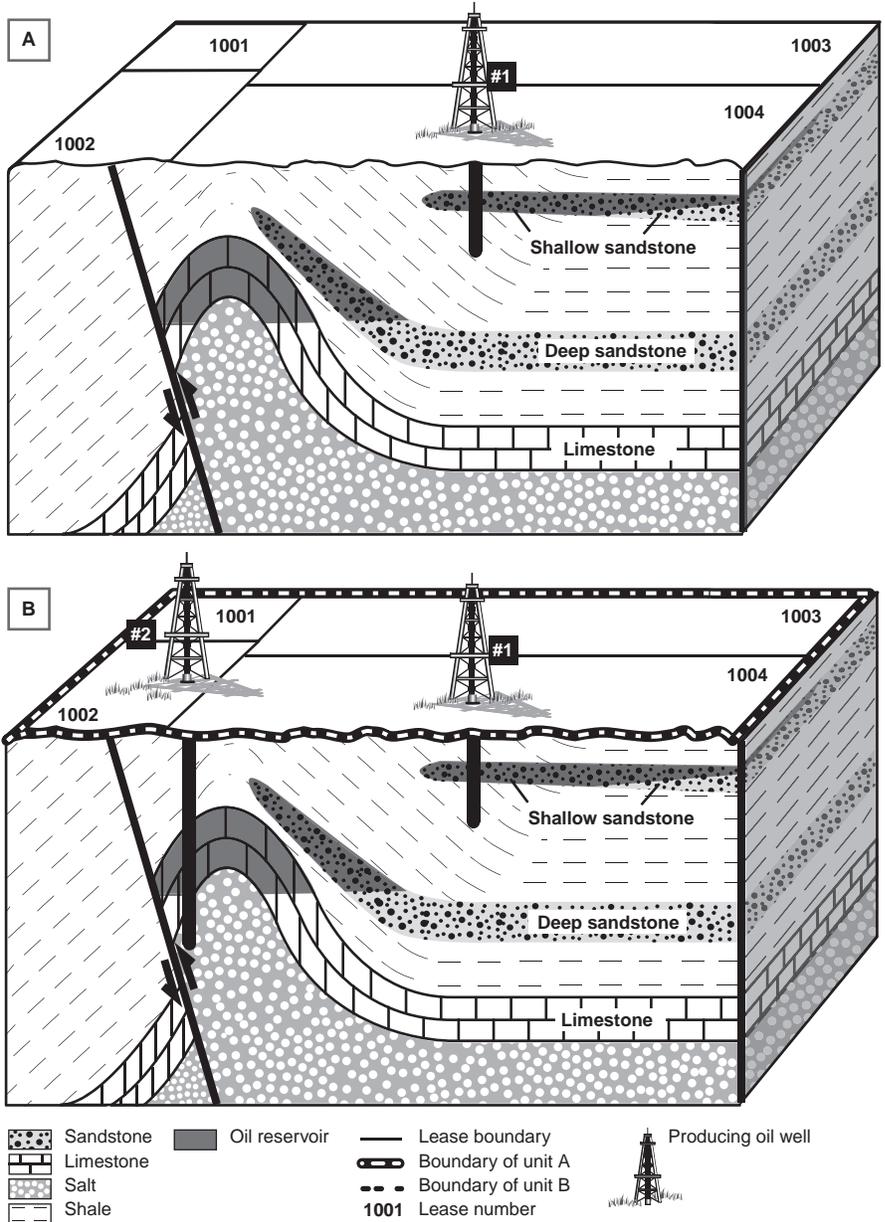
Scenario A:

The most straightforward example of paying royalties occurs when Company X, which owns lease 1004, drills well #1 and discovers oil in the shallow sandstone, as illustrated in scenario A. Company X submits one royalty report for lease 1004 and does not complete the agreement data field since the lease is not part of an agreement. Auditors have no difficulty in auditing this lease because there is only one producing zone, the shallow sandstone.

Scenario B:

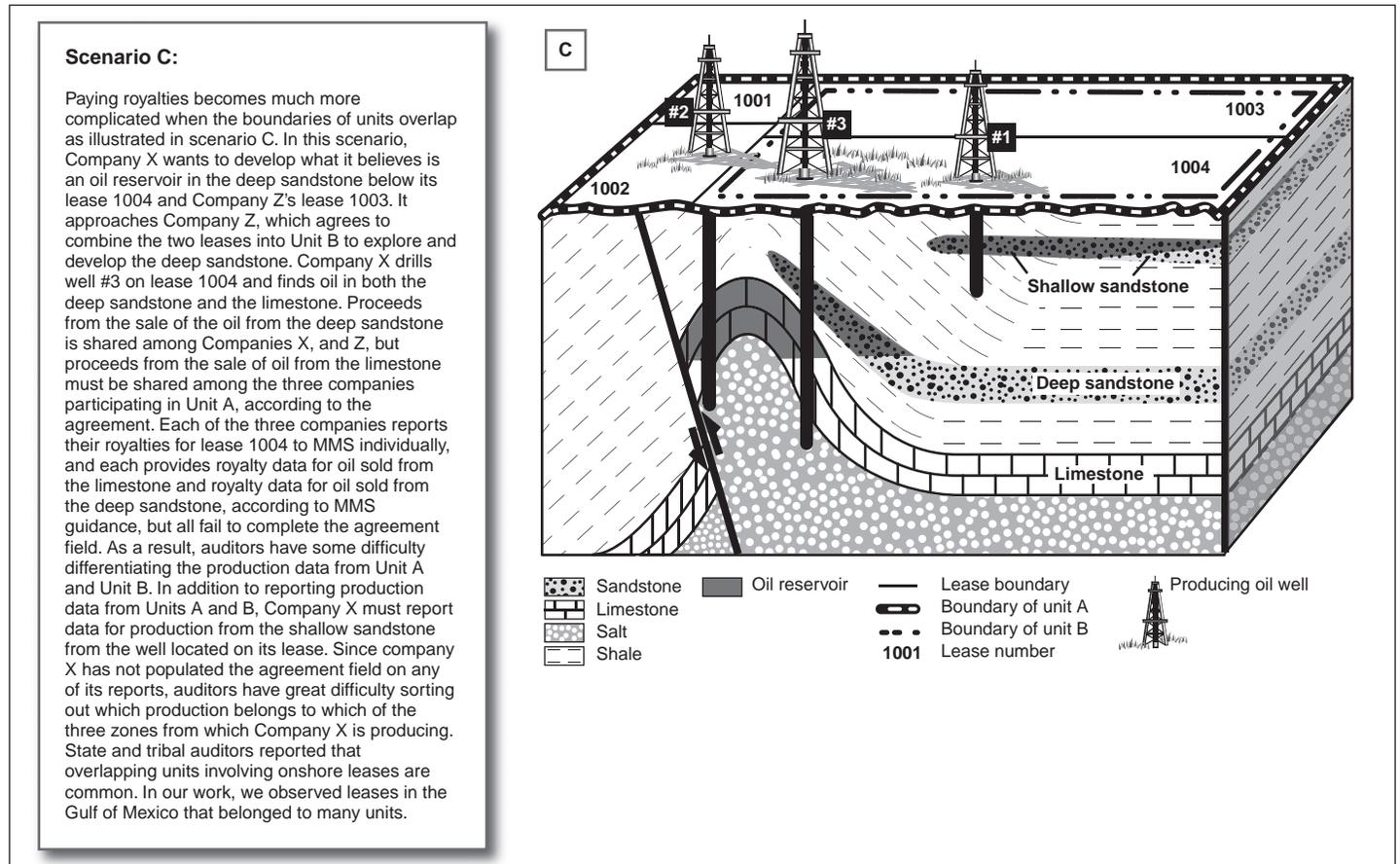
This simple example can become more complex over time, such as the creation of a federal unit as illustrated in scenario B. Based on a seismic survey, Company Y wants to develop what it believes is an oil reservoir in the limestone on the leases it owns, leases 1001 and 1002. Because it believes the reservoir also extends below leases 1003 and 1004, it approaches the owner of lease 1003, Company Z, and the owner of lease 1004, Company X, to form an agreement combining all four leases into Unit A, to share the risk and expenses of drilling and any profits from the sale of oil. Companies X and Z agree to do so but restrict the unit to production from the limestone.

Company Y drills well 2 on lease 1002 and finds oil in the limestone, and proceeds from the sale of this oil is shared among the three companies. Each of the companies reports their respective royalties on lease 1002 to MMS separately, and all forget to complete the agreement field, which is required by MMS regulations. Auditors have little difficulty in auditing these royalty data because there is only one producing zone on the lease.



Source: GAO.

Figure 8: Block Diagram Illustrating a Hypothetical Complex Relationship between Unit Agreements and Potential Impacts on Oversight



Source: GAO.

Complex ownership patterns of federal leases, particularly those issued by BLM for onshore lands, may also further impact the accuracy of royalty data, according to several oil and gas company representatives. For example, when there are intermingled federal, state, and private leases, royalty reporting can be challenging because companies said that they may need to rely on multiple operators to provide royalty information, which is not always consistent and clear, and because different regulations and rules apply to federal, state, and private leases. Confusion can sometimes cause the first royalty payment to MMS to be delayed.

Industry Representatives Stated That Ambiguous Federal Regulations Can Create Difficulty in Establishing Gas Prices

Representatives from four companies reported that the ambiguity in extensive federal regulations that establish prices for oil and gas lead to difficulty in interpretation and hence, calculating the correct royalty payment. Nine of the 11 state and tribal auditors that we interviewed told us that the gas valuation regulations published in 1988 are out of date and that the series of benchmarks within these regulations that prescribe prices for gas are impractical to apply. Concerning the gas regulations, the RPC report noted the difficulty of applying these benchmarks and recommended that MMS consider using market indices to establish gas prices when companies sell to their affiliates in lieu of the 1988 benchmarks.¹⁹ RPC also recommended that MMS more clearly define allowable transportation and processing deductions for natural gas in their regulations.

Royalty Reports May Be Due before Payors Have All the Necessary Data to Accurately Complete These Reports, Which Necessitates Later Adjustments

In addition, three companies reported difficulty in paying royalties on gas production in a timely manner because they do not receive data from their gas purchasers in time to meet MMS's deadline for filing royalty reports and must submit estimates and later correct them. For example, a purchaser of oil and gas may report an adjustment to the volume of the gas purchased or the quality of the oil purchased after the payors are required to report, resulting in the payor having to make a correction to the original data. Reporting on gas is especially challenging, because gas transportation and processing are usually not reconciled within 30 days. However, payors are required to report royalties to MMS on or before the last day of the month following the month the product was sold or removed from the lease. Therefore, to stay in compliance with reporting requirements and avoid penalties, some company representatives reported that they file estimated gas royalty reports and keep funds deposited with MMS to cover variances in royalties due. This is not problematic as long as companies correct their original data as necessary and pay the correct amount of royalties.

¹⁹ A sale of gas by a company to its affiliate is commonly referred to as a non arm's-length transaction, and according to the gas valuation regulations, the value of the gas is established according to the benchmarks. If a company sells gas to another company with which it is not affiliated, the transaction is commonly referred to as an arm's-length transaction, and the value of the gas is the sales price and any additional compensation that accrues from the sale.

Royalty Reports on New Leases Are Rejected by MMS's System When BLM Does Not Provide the Lease Information to MMS in a Timely Manner

Oil and gas company representatives stated that BLM data on new leases and units is not always incorporated into MMS's system in a timely manner, resulting in edit checks rejecting correct payor data. Two of these representatives reported that BLM's delays in revisions to data on participating areas—the part of a unit for which participating companies have agreed to a manner for allocating production—can cause them to go back and adjust MMS royalty data that is over a year old.²⁰ This lack of coordination between BLM and MMS was also addressed in the December 2007 RPC report, which found that incorrect data leads to errors in royalty receipts and revenue distribution, requiring MMS staff to correct the information and redistribute the revenue. The RPC report recommended that BLM and MMS improve data exchanges by establishing a coordinating committee with representatives from senior management levels, which would be charged with defining common data standards and developing solutions for technical issues of coordination and information sharing at MMS and BLM. MMS is addressing this issue.

Oil and Gas Company Representatives Generally Understand Key Data Fields, but Better Clarification of Certain Codes Could Improve the Accuracy of Payor Reports

While oil and gas company representatives with whom we spoke reported that they generally have little difficulty understanding key data required to complete the Form MMS-2014, most state auditors with whom we spoke identified some problems with company submitted data. All 10 of the representatives we contacted explained that the major data fields, such as the sales value, sales volume, and royalty value, are easy to understand and complete. Eight of the representatives added that major royalty reporting codes, such as those that define product types and that provide more information on the nature of the sale of oil and gas, are also easy to understand. Only two representatives reported some difficulty with using certain codes. However, 8 of the 11 state and tribal royalty auditors that we contacted identified a specific product code that creates difficulty for oil and gas companies in reporting royalties. Specifically, state auditors told us that product code 39 for coalbed methane is inconsistently used by payors reporting royalties, creating difficulty in auditing leases. During our analysis of MMS's royalty data, we also noted that some companies claim a processing allowance for coalbed methane, which is not processed, possibly indicating confusion on use of this code. Additionally, these auditors told us that a certain code used to explain adjustments, known as adjustment reason code 10, is commonly used by royalty payors for all

²⁰In some cases, units are revised to either expand or contract to reflect better understanding of how oil and gas reservoirs are connected and can be developed.

types of adjustments. They said that not having specific adjustment reason codes for volume adjustments, price changes, royalty adjustments, processing allowance adjustments, and transportation allowance adjustments, makes it difficult for auditors to clearly determine why a royalty payment was adjusted.

Conclusions

Royalties paid to the federal government for the extraction of oil and natural gas from federal lands and waters remain both a large source of revenue to the federal government and a key element in the discussion on how to balance the use of these lands. Our past work has consistently raised questions about how MMS oversees the collection of these royalties and ensures that the country receives fair value for the resources removed.

MMS has ongoing efforts to improve the reasonableness and accuracy of its royalty data. However, the agency still has more to do to ensure that key data used to report, pay, and audit federal royalties are accurate. In our view, MMS still lacks some effective controls to (1) prevent erroneous data on allowances from being accepted into the system, (2) detect errors in data once they are accepted into the system, and (3) ensure that key data needed for complex oil and gas units are consistently provided, and this can make the auditing and other compliance work done by MMS staff more difficult and could result in the federal government not receiving all the royalties it is due. In particular, our detailed examination of a portion of key fiscal year 2006 and 2007 data has identified missing data, significant errors, and questionable data, raising doubts about the 97 percent accuracy level that MMS reports. In light of our findings, it seems unlikely that MMS could sustain its goal of 98 percent data accuracy without taking additional steps.

Recommendations for Executive Action

To improve the accuracy of royalty data and to help provide a greater assurance that federal oil and gas royalties are being accurately reported, to improve the efficiency of audit and compliance activities, and to increase the likelihood of collecting additional royalties in a timely manner, we are recommending that the Secretary of the Interior direct MMS to take five actions.

To better prevent the submission of erroneous data into MMS's database, we are recommending that MMS:

- share with payors that submit their data through the Electronic Data Interchange (EDI) MMS's recent edit check that prevents payors from

submitting data claiming processing allowances for gas that is not processed, including coalbed methane.

To improve the quality of data that has been accepted by MMS's database, we are recommending that MMS:

- design and implement additional edit checks to evaluate the net impact of all adjustments on original entries for critical royalty variables, including sales values, royalty values, sales volumes, transportation allowances, and processing allowances, by summing each month all entries for the variable submitted by each payor for each lease and each commodity and highlight potentially erroneous submissions to payors and appropriate MMS staff and
- use the monthly sums of original and adjusting entries for royalty values, sales values, and sales volumes to ensure that calculated royalty rates and unit prices for each payor on each lease for each commodity fall within expected ranges and highlight potentially erroneous submissions to payors and appropriate MMS staff.

To simplify the auditing of leases and compliance work, we are recommending that MMS:

- enforce current MMS requirements to populate the agreement field with the correct agreement number and to populate the agreement field for leases outside of agreements with a single unique code that is easily identifiable, and
- collaborate with state and tribal auditors on the possibility of adding more specific adjustment reason codes that describe why payors made corrections to royalty data on the Form MMS-2014.

Agency Comments and Our Evaluation

We provided a draft of this report to Interior for review and comment. Interior provided written comments, which are presented in appendix II. In general, Interior agreed with our findings, concurring with four of our five recommendations and partially concurring with the other recommendation. With regard to this latter recommendation, which involves populating the agreement field, Interior agreed with us that it is important that MMS improve the enforcement of requirements for populating the agreement field. However, Interior was uncertain about how best to achieve this goal and stated that MMS is evaluating the best methods to ensure accurate reporting for agreements.

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 of this report to appropriate congressional committees, the Secretary of the Interior, the Director of MMS, and other interested parties. In addition, the report will be available at no charge on GAO's Web site at <http://www.gao.gov>.

If you or your staffs 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. Key contributors to this report are listed in appendix III.



Frank Rusco
Director, Natural Resources
and Environment

Appendix I: Scope and Methodology

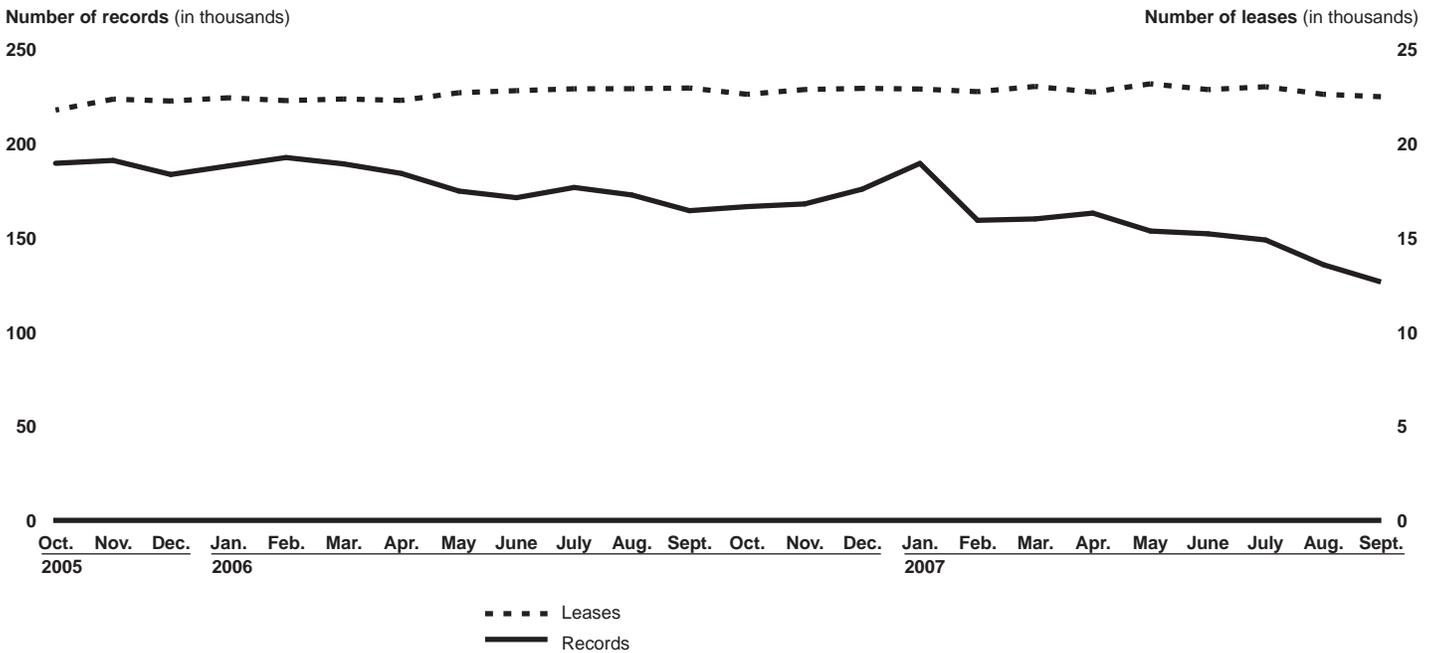
To examine MMS's key efforts to improve the accuracy of royalty data, we reviewed and discussed with MMS officials their action plans to implement RPC recommendations, reviewed a demonstration of MMS's Compliance Program Tool (CPT), discussed their implementation of the CPT to systematically identify misreported volumes and missing royalty reports, reviewed their plan to monitor adjustments, and discussed efforts to adopt additional edit checks.

To assess the reasonableness and completeness of MMS's royalty data, we obtained from MMS an extract from their financial management system consisting of all oil and gas royalty records from fiscal years 2006 and 2007 and assessed the completeness and reasonableness of key data fields based on extensive data reliability studies documented in two previous GAO reports.¹ We removed records related to rental payments, gas storage agreements, taxes, contract settlements, and geothermal operations by using transaction codes, and removed sulfur, helium, nitrogen, and carbon dioxide, using product codes. We also limited our analysis to cash royalty payments, excluding royalty-in-kind (RIK) payments whenever possible or appropriate. Our resulting analysis file consisted of about 4.1 million royalty records.

First, we assessed the completeness of MMS's data. We developed a frequency distribution of the number of records per month and compared these frequencies from month-to-month, looking for abnormal patterns. We discovered that there were about half as many records for April 2007 as for other months on average. At our request, MMS investigated the reason and discovered that the contractor who extracted the data inadvertently excluded records accepted by MMS's system in June 2007—the month in which much of the data from April 2007 would have been submitted and accepted. We then obtained from MMS a new file of records accepted in June 2007 and combined the new data with the rest of the royalty data, and rechecked the monthly totals. This procedure revealed a fairly consistent number of records and leases on a month-to-month basis. We determined that the data we received from MMS were a complete representation of what was in their data system through our study date and was therefore reliable enough to allow us to use the extract in our more detailed review of royalty data. This monthly consistency is illustrated in figure 9.

¹[GAO-04-448](#) and [GAO-06-786R](#).

Figure 9: Numbers of Oil and Gas Royalty Records and Leases Reported per Month for Fiscal Years 2006 and 2007



Source: GAO analysis of MMS data.

To examine the completeness of records in more detail, we analyzed a subset of MMS’s royalty data—leases that produced natural gas in the offshore Gulf of Mexico. We chose this subset because of: (1) its relatively manageable size—about 2,100 leases out of a total of about 29,000 producing federal and Indian oil and gas leases and (2) its financial significance—the gas royalties from Gulf of Mexico leases in fiscal year 2008 account for almost 30 percent of total federal and Indian oil and gas royalty revenues.² For each lease, we compared gas volumes reportedly sold by payors on Form MMS-2014 to gas volumes reportedly produced by operators on MMS’s OGOR. Specifically, for each lease we added together all sales volumes on the Form MMS-2014 of processed and unprocessed gas in thousands of cubic feet for each month from January 2006 to September 2007 and compared these to gas volumes disposed of on the OGOR-B for the same month. From the Form MMS-2014, we included volumes for cash sales (transaction code 01), royalty-in-kind sales

²Lease data are from MMS’s Web site and include onshore and offshore leases current to November 14, 2008. We assumed that all offshore leases in the Gulf of Mexico produced some gas.

(transaction codes 06 and 08), and non-royalty bearing sales under provisions for deepwater royalty relief (transaction code 41). We excluded from our analysis October through December 2005 because major hurricanes disrupted production in the Gulf of Mexico, resulting in many production facilities being shut down. We also used data from MMS's Technical Information Management System (TIMS) to identify all leases that belonged to unit agreements and excluded these leases in order to simplify the analysis. This resulted in about 1,500 producing gas leases. Also, a significant number of these leases had royalty reports but no production reports, but missing production reports were more prevalent for the last 3 months of fiscal year 2007, possibly indicating that these reports had not yet been received or accepted by MMS's system.

To investigate the completeness of individual royalty records, we examined key royalty data fields to ensure that they were populated. These data fields are necessary to match royalty payments to the proper payor, lease, sales month, and product code. Fields included payor number, lease number, sales date, and transaction code. We also checked that product code and sales type were populated. Because nearly 100 percent of these critical data fields were populated, we discontinued additional tests on assessing the completeness of individual data fields. However, we examined certain data fields to ensure that they were not populated when they should not be. These fields included sales value and sales volume for certain transaction codes, including minimum royalty due (transaction code 02), estimated royalty payment (transaction code 03), transportation allowance (transaction code 11), processing allowance (transaction code 15), and quality bank adjustment (transaction code 13). Population of these data fields could result in counting sales values and sales volumes twice.

We then developed tests to investigate the gross reasonableness of certain data fields that our past work highlighted as being problematic, including royalty value, sales value, sales volume, transportation allowance, and processing allowance. We identified royalty-in-kind transactions from transaction codes (06 and 08) and excluded them from this analysis. We employed a technique that is different from MMS's edit checks, which generally examine only individual royalty lines. We summed the data fields on all royalty records for each month on each lease for each royalty payor and product code. This technique aggregated the original royalty record with all subsequent adjustments, allowing us to examine the net effect and easily identify negative sums for royalty values, sales values, or sales volumes, which MMS's edit checks of individual lines cannot identify. Since payors generally submit one electronic fund transfer for all the

leases upon which they owe royalties for a given month, a negative sum can go undetected if submitted along with many other positive sums. Although we found a relatively small percentage (less than or equal to 0.2 percent) of negative sums, we examined the corresponding royalty lines to determine if their financial impact was significant.

We used the same technique of summing royalty records to examine the gross reasonableness of transportation and processing allowances. Being deductions, these allowances should be negative. We found that transportation allowances and processing allowances were positive 3.8 percent and 10.1 percent of the time, respectively. However when we examined individual royalty records, we discovered that many of these records were associated with royalty-in-kind transactions, and therefore outside of the scope of our analysis. MMS, who creates the royalty-in-kind data, did not properly identify these RIK leases with the designated royalty-in-kind transaction codes (06 and 08), but instead used the codes for transportation (11) and processing (15) allowances. An MMS official with the RIK program explained that, due to constraints in their RIK system, some transportation and processing allowances could be positive due to their RIK system having populated the transportation and processing data fields for the current month with changes to prior months reported by pipelines and processing plants. This official also said that the RIK system included all revenues and expenses associated with natural gas liquids from the RIK leases in the processing allowances. These processes for RIK leases are inconsistent with processes for leases on which royalties are paid in cash. For cash royalties, adjustments to previous periods are posted to the specific sales month, not the current month. Also for cash royalties, revenue is identified as sales value, and allowable expenses, such as transportation or processing allowances, are individually identified as transportation or processing allowances for the appropriate product code. The MMS official said that they corrected this system problem in July 2007. We were then able to identify the RIK leases through their payor codes, which are alphanumeric as opposed to the numeric payor codes of cash royalty payments, and subsequently removed them. We also checked for transportation and processing allowances being taken in excess of the maximum amounts allowed by federal regulations and checked to see if transportation and processing allowances were taken for transaction codes for which they are not permitted, such as minimum royalties (transaction code 2), estimated royalty payments (transaction code 3), quality banks (transaction code

13), and offshore deep water royalty relief (transaction code 41).³ Lastly, we examined royalty data to see if payors reported processing allowances for products that are not processed, such as oil, condensate, unprocessed gas, and coalbed methane.

We then investigated the reasonableness and accuracy of royalty values, sales values, and sales volumes in more detail because these royalty data fields appeared to be problematic in our previous work.⁴ Using the same method of summing these data fields each month for all royalty records for each payor for each lease and each product, we calculated the royalty rates by dividing royalty value prior to allowances by sales value. We then compared our calculated royalty rates to expected royalty rates based on general lease terms because we did not have access to individual lease terms for the estimated 29,000 producing federal and Indian leases. For offshore leases (product codes 01, 02, 03, 04, and 07), we used royalty rates of 12.5 percent and 16.67 percent for comparison.⁵ We identified the lease numbers associated with royalty rates outside of expected values and compared the calculated royalty rates of these 331 leases to royalty rates for these leases in the TIMS database. Sixteen of these leases had royalty rates other than 12.5 or 16.67 percent, and we adjusted our analysis accordingly. For onshore federal gas production (product codes 03, 04, and 07), we compared our calculated royalty rates to the same royalty rates as for offshore leases. For onshore federal oil production, we compared initially our calculated royalty rates to rates of 12.5 percent to 25 percent.⁶ According to MMS, this latter interval included a number of prescribed royalty rates that were common for oil production from certain leases issued before 1988. However because of the large number of calculated onshore oil and gas royalty rates that fell outside of expected values, we selected a sample of onshore leases for MMS to research. MMS reported that several leases had royalty rates that were either 5 percent or 10 percent—rates that they identified as common for certain older leases. We adjusted our onshore comparison to include these two rates as

³Maximum permitted transportation allowances are 50 percent of sales value. Maximum permitted processing allowances are 66 and 2/3 percent of the sales value less the cost of transportation.

⁴[GAO-06-786R](#), p. 12.

⁵Specifically, we identified exceptions to be outside of the range 12.4 to 12.6 percent and 16.567 to 16.767 percent, to account for rounding error.

⁶Specifically, we identified exceptions to be outside of the range 12.4 to 25.1 percent, to account for rounding error.

acceptable. Because few other leases had royalty rates that were uncommon, we did not ask MMS to research additional onshore leases. For Indian leases, we similarly calculated royalty rates and determined that few leases had royalty rates of less than 12.5 percent, so we did not pursue comparing these to actual lease terms.

We further investigated the reasonableness and accuracy of royalty values, sales values, and sales volumes by calculating unit oil and gas sales prices with Gulf of Mexico monthly data submitted by royalty payors for each lease. We limited our analysis to the offshore Gulf of Mexico because this area has well developed transparent markets where regional prices are readily available, unlike onshore markets. To compare oil prices, we used a range of market prices each month for comparison, the low price being the lowest daily spot price that month for Mars oil (rounded down to the nearest dollar), and the high price being the highest daily spot price for light Louisiana sweet (rounded up to the nearest dollar). We investigated doing similar comparisons onshore but discovered that the price range onshore, with West Texas Intermediate among the highest priced oil we found, and Wyoming asphaltic being about the lowest priced oil we found, created a range that was so wide that it made any comparison meaningless. To compare gas prices, we examined the maximum mid-day spot price, the minimum mid-day spot price, and the First of the Month price at the Henry Hub and chose the highest and the lowest price from among the three (we rounded the lowest price down to the nearest dollar and rounded the highest price up to the nearest dollar). In calculating unit gas prices from MMS royalty data, we used volumes expressed per MMBtu to remove the effects of quality on price. As with oil prices, we investigated doing gas price comparisons onshore but found that exceptionally low gas prices at Opal, Wyoming created a range of prices that was so wide as to make any comparisons meaningless.

To examine factors that affect oil and gas companies' abilities to accurately report royalties owed to the federal government, we interviewed a limited number of oil and gas company representatives. To solicit views on oil and gas companies' experiences with reporting royalty data to MMS, we used a nonprobability sample. To draw our sample, we identified the 20 oil and gas companies that submitted the highest number of royalty lines on Form MMS-2014 in fiscal years 2006 and 2007 and contacted representatives from the top 15 to request information. The top 20 companies accounted for 63 percent of all the royalty lines reported, and the top 15 accounted for more than 56 percent. In addition, we contacted the two largest national oil and gas industry associations—American Petroleum Institute (API) and the Independent Petroleum

Association of the Mountain States (IPAMS)—to request information. IPAMS describes itself as a non-profit trade association representing more than 400 independent oil and natural gas producers, service and supply companies, banking and financial institutions, and industry consultants committed to environmentally responsible oil and natural gas development in the Intermountain West. API reports that it is the only national trade association that represents all aspects of America's oil and natural gas industry. API has 400 corporate members, from the largest major oil company to the smallest of independents. They include producers, refiners, suppliers, pipeline operators, and marine transporters, as well as service and supply companies that support all segments of the industry.

For our semi-structured interview questions, we received a total of 10 responses from oil and gas companies. Specifically, of the 15 companies with the most royalty lines, 2 responded to our request. From API members we received two responses, and from IPAMS members we received six responses. We personally met with two company representatives at the IPAMS office and discussed their written responses to our questions. Membership in these associations and being identified as 1 of the 15 companies is not mutually exclusive. Results from this nonprobability sample cannot be used to make inferences about all oil and gas companies, because the companies that were not included in our list of the top royalty payors or members in the associations we contacted had no chance of being selected as part of the sample.

Appendix II: Comments from the Department of the Interior



United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, DC 20240



JUN 30 2009

Mr. Frank Rusco
Director, Natural Resources and Environment
Government Accountability Office
441 G Street, NW
Washington, D.C. 20548

Dear Mr. Rusco:

Thank you for the opportunity to review and comment on the Government Accountability Office draft report entitled, *Mineral Revenues: MMS Could Do More to Improve the Accuracy of Key Data Used to Collect and Verify Oil and Gas Royalties* (GAO-09-549).

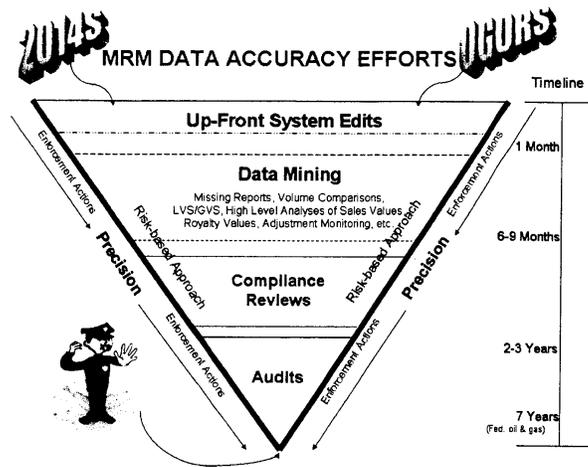
We generally agree with your findings and concur with four of your five recommendations. We partially concur with Recommendation 4. Our responses to each recommendation are provided in the Enclosure.

As noted in the draft report, the Minerals Management Service has several efforts underway to improve the accuracy of the payor-reported data used to collect and verify royalties. One key effort is the implementation of recommendations identified by the Royalty Policy Committee¹ to improve edit checks, monitor the quality of natural gas, revise gas valuation regulations, and improve coordination with the Bureau of Land Management. The MMS is aggressively implementing the RPC recommendations and has already taken steps to improve the accuracy and completeness of royalty data.

As GAO noted in the draft report, MMS subjects payor-reported royalty data to more than 140 edit checks and has incorporated up-front edits to prevent payors who report their royalties via the Web from submitting erroneous data. More recently, MMS has initiated a data mining effort as a second level screening process to increase the accuracy of payor-reported data before the data is subjected to compliance reviews and ultimately to audit.

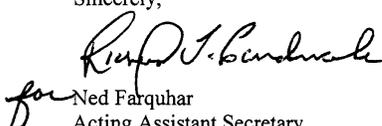
The diagram below illustrates MMS's overall data accuracy concept:

¹ The Royalty Policy Committee is chartered to provide advice to the Secretary of the Interior on managing Federal and Indian mineral leases and revenues.



Current technology has opened new avenues for MMS to identify and analyze erroneous data on a real-time basis. The MMS's data mining processes and analyses, when fully implemented, will be similar to Recommendations 2 and 3 in the draft report.

We appreciate GAO's insights and recommendations to improve royalty data accuracy. If you have any questions, please contact Andrea Nygren, MMS Audit Liaison Officer, at (202) 208-4343.

Sincerely,

 Ned Farquhar
 Acting Assistant Secretary
 Land and Minerals Management

Enclosure

Enclosure

Response to Government Accountability Office draft report entitled, *Mineral Revenues: MMS Could Do More to Improve the Accuracy of Key Data Used to Collect and Verify Oil and Gas Royalties* (GAO-09-549).

Recommendation 1: *Share with payors that submit their data through the Electronic Data Interface MMS's recent edit check that prevents payors from submitting data claiming processing allowances for gas that is not processed, including coalbed methane.*

Response: Concur. The edit check that prevents payors that submit royalty reports via the Web from claiming processing allowances against unprocessed gas went into effect in April 2009. We have shared this edit with those payors that submit their data through EDI so that they may modify their systems. We are scheduled to implement this edit in the Minerals Management Service Minerals Revenue Management financial system in November 2009, so that the edit will apply to all payors, including those who submit their data through the EDI.

Recommendation 2: *Design and implement additional edit checks to evaluate the net impact of all adjustments on original entries for critical royalty variables, including sales values, royalty values, sales volumes, transportation allowances, and processing allowances, by summing each month all entries for the variable submitted by each payor for each lease and each commodity and highlight potentially erroneous submissions to payors and appropriate MMS staff.*

Response: Concur. The MMS recently designed and is in the process of implementing additional edit checks to improve the accuracy of royalty rates and pricing data reported to MMS. In addition, MMS has initiated a data mining effort as a second level screening process to increase the accuracy of payor-reported data before the data are subjected to compliance reviews and ultimately to audit. The MMS's data mining process, when fully implemented, will address this recommendation and will include monitoring adjustments made by payors to royalty reports, detecting missing royalty reports, comparing payor-reported sales volumes to third party source documentation, analyzing trends in payor-reported data, and analyzing key royalty variables to ensure they fall within expected ranges.

Recommendation 3: *Use the monthly sums of original and adjusting entries for royalty values, sales values, and sales volumes to ensure that calculated royalty rates and unit prices for each payor on each lease for each commodity fall within expected ranges and highlight potentially erroneous submissions to payors and appropriate MMS staff.*

Response: Concur. The MMS recently designed and is in the process of implementing additional edit checks to improve the accuracy of royalty rates and pricing data reported to MMS. In addition, MMS has initiated a data mining effort as a second level screening process to increase the accuracy of payor-reported data before the data are subjected to compliance reviews and ultimately to audit. The MMS's data mining process, when fully implemented, will address this recommendation and will include monitoring adjustments made by payors to royalty reports, detecting missing royalty reports, comparing payor-reported sales volumes to third party source documentation, analyzing trends in payor-reported data, and analyzing key royalty variables to ensure they fall within expected ranges.

Enclosure

Recommendation 4: *Enforce current MMS requirements to populate the agreement field with the correct agreement number and to populate the agreement field for leases outside of agreements with a single unique code that is easily identifiable.*

Response: Partially Concur. The MMS is working to improve enforcement of agreement field reporting. We are not confident that populating the agreement number field for lease-basis reporting with a single unique code is the best solution to enforce proper reporting. The MMS is evaluating the best methods for ensuring that payors accurately populate the agreement number field.

Recommendation 5: *Collaborate with state and tribal auditors on the possibility of adding more specific adjustment reason codes that describe why payors made corrections to royalty data on the Form MMS-2014.*

Response: Concur. We agree that the Form MMS-2014 should identify why payors make corrections to royalty data; however, we are not confident that adding more adjustment reason codes is the best solution to demonstrate reasons for corrections to royalty data. The MMS management and internal audit staff will collaborate with State and Tribal auditors to find the best solution.

Other: In addition to the above responses to GAO's recommendations, we are bringing the following to your attention. On page 10 of the draft report, GAO states that MMS has a target date for completion of new proposed gas valuation regulations of December 2009. The MMS is revising that target date pending direction from the Department regarding royalty reform.

Appendix III: GAO Contact and Staff Acknowledgments

GAO Contact

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

Staff Acknowledgments

In addition to the individual named above, Jon Ludwigson, Assistant Director; Ron Belak; Melinda Cordero; Alison O'Neill; Kim Raheb; Barbara Timmerman; and Mary Welch made key contributions to this report.

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