



A Review of the Oil and Gas Industry Arguments against the BLM Methane Waste Prevention Rule

Conservation Economics Institute¹

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¹ Primary Contacts: Pete Morton, Ph.D. Senior Economist, Conservation Economics Institute (pete@conservationecon.org); and Evan Hjerpe, Ph.D. Executive Director, Conservation Economics Institute (evan@conservationecon.org). Paper prepared for The Wilderness Society.

Executive Summary

The BLM's methane waste prevention Rule, which went into effect on January 17th, 2017, was put in place to help ensure a fair return to public taxpayers from oil and gas development on public and tribal lands. The Government Accountability Office (GAO) (2010) estimated taxpayers lose as much as \$23 million in royalty revenues each year when this natural gas is not captured. The BLM's Final Rule represents a triple-win scenario where capturing previously wasted natural gas provides benefits to taxpayers, the oil and gas industry, and to public health by reducing pollution.

Despite the logical and beneficial aspects of the Rule, representatives for the oil and gas industry want the Rule repealed based on claims of economic hardship estimated in a memo from John Dunham and Associates. The JDA memo claims \$1.26 billion in economic impacts and compliance costs – a claim that has been repeated by industry groups and the media. In stark contrast, the BLM estimated about \$200 million in average compliance costs and minimal economic impacts (i.e. changes in industry output and wages) from the Rule. The BLM also found that the benefits of the Rule outweigh the costs by an average of \$150 million annually. The BLM compliance costs are much less because the JDA estimate wrongly included alleged distributional impacts (i.e. output, wages, and taxes) in its estimate of compliance costs.

Because there is conflicting rhetoric on the economic effects of the Rule, we decided to peer review the merits of the JDA memo and overall industry arguments against the Rule. Here is what we found:

- 1) JDA's estimate of economic impacts (changes in wages, output, and taxes), comprising more than \$1 billion of the \$1.26 billion figure listed, is inaccurate. JDA made no acknowledgement of jobs and output that will be created from new gas that is captured, engineering, consulting, leak detection, and monitoring. When considering the NET effect of the Rule, overall output and jobs are likely to increase rather than decrease.
- 2) The JDA memo ignores the phased-in approach of the Rule and the allowable exemptions if compliance costs are unduly costly. That is, if some marginal wells were forced to cease production due to rule compliance costs, they can get exemptions from the Rule. These two factors ensure that impacts will be able to be planned out in advance, and the most adversely affected operators are exempt from many compliance aspects.
- 3) JDA commits an egregious economics mistake by conflating changes in jobs and output with costs and benefits of the Rule. Industry output (and jobs) from oil and gas revenue represent distributional economic impacts, where gains or losses in output from regulatory policy shift from one place to another. As such, economists separate economic impacts from costs and benefits of the Rule. JDA's analysis is an inaccurate depiction of the economic reality related to the Rule, and does not accord with standard economic theory.
- 4) The JDA Memo is flawed because its analysis cannot be checked or replicated—JDA did not cite to any dataset, detail any of the assumptions for its economic model, or provide its methodology.

- 5) The entire JDA analysis relies on one blanket starting assumption---that the Rule will cause 4,700 fewer oil wells to be undertaken with a correlating reduction of 112 million barrels of oil in the future due to the compliance costs of the Rule. This assumption is never explained or investigated. Rather, the JDA memo only says that this starting assumption is based on “JDA’s dynamic model of the oil and natural gas industry” and “internal JDA estimates.” In reality, overall production is likely to increase under the Rule.
- 6) Prices change and energy markets are dynamic, not static. Inexplicably, JDA criticizes the BLM for modeling a dynamic market. The BLM correctly modelled a dynamic natural gas market by allowing price to change based on forecasts from the Energy Information Administration.
- 7) The JDA analysis excludes the revenue generated by capturing more methane for sale by, for example, leak detection and repair at wellheads. This marketed new gas will generate significant revenue, or cost savings that will reduce net compliance costs, which can spur substantial positive economic impacts in jobs and output. JDA also excludes new taxes coming from increased gas sales.
- 8) Plugging leaks at wellheads also creates jobs in the methane mitigation industry, similar to that of your local plumber. The JDA memo completely ignores the jobs created as a result of increases of demand in the methane mitigation industry. Forty years of economic research has shown that by and large, regulatory policies drive innovation and create jobs.
- 9) JDA does not consider net effects. A valid economic impact analysis of regulations on federal lands must consider the net effects, not just a one-sided industry perspective. Oil and gas development on public lands affects everybody, not just the oil and gas industry.
- 10) Congressional leaders who are actually concerned about creating millions of American jobs, should be endorsing the BLM methane capture rule.

In summary, after reviewing the JDA memo we found it lacking in transparency, in economic rigor and merit. Because of the lack of transparency in data and questionable methods, the \$1.26 billion in costs cited by industry groups should be summarily rejected by the public and federal decision makers. The inaccurate and contradictory assumptions render the JDA memo flawed, unable to stand up to economic scrutiny, and are devoid of any supporting economic theory.

In contrast to the JDA memo, the data and methods used by BLM to determine compliance costs and compare them to benefits are transparent and sound. BLM properly assigned dynamic market prices to calculate the value of the methane captured due to the Rule. BLM’s analysis of compliance costs is reasonable, and BLM rightly found that the modest compliance costs would not have a significant impact on a substantial number of small entities. Overall, the BLM’s methane capture rule is an improvement in economic efficiency at both the national and regional levels.

Introduction

The Department of the Interior is working to address natural gas waste from oil and gas development on Federal and Tribal lands. The Government Accountability Office (GAO) (2010) estimated taxpayers lose as much as \$23 million in royalty revenues each year when natural gas is not captured. The issue of methane waste on public lands made national headlines when NASA discovered a methane cloud hovering overhead the San Juan Basin in Four Corners region of northwest New Mexico (Kort et al. 2014).

The Bureau of Land Management (BLM) has responded to these problems by revising federal oil and gas rules in order to bring them up to date with current technology, reduce natural gas waste and provide a fair return on public resources for taxpayers. The final rule (Rule) limits losses of gas through venting and leaks from well drilling, completions and workovers, production testing, pneumatic controllers and pumps, storage tanks, liquids unloading, and leak detection and repair (LDAR). The Rule also prohibits venting of gas except in certain circumstances, and limits gas flaring during normal production operations from developmental oil wells.

The BLM's 2016 Regulatory Impact Analysis (RIA) concludes that at the economic margin, the cost of complying with the methane capture rule is small. These results are consistent with our research and review of the economic literature: the cost of complying with environmental regulations is not a large cost burden. The reasons for this include: 1) regulatory compliance costs are small relative to total business costs; 2) comparable regulations exist across state lines and from country to country; 3) other economic factors like drilling and labor costs play a more significant role in location decisions; 4) technological change stimulates innovation and increases productivity which offsets the costs of regulation; and 5) cost savings from newly captured gas will reduce overall compliance costs.

Despite 40 years of economic research indicating that environmental regulations have not resulted in significant job losses, the oil and gas industry and their Congressional allies continue to propose gutting laws and regulations that protect the environment. The latest attempt is a short memo from John Dunham and Associates (JDA) on the purported impacts of the BLM's methane capture rule (Dunham 2016). Our review of the JDA memo indicates that their analysis is inaccurate and lacking in economic credibility. The JDA memo could not hold up under legal, or even casual scrutiny, and is based entirely on a straw man argument that the Rule will stifle production and lead to cascading effects in the oil and gas industry. This speculation is unlikely to occur and neglects to consider new revenue and jobs created from captured gas and new jobs coming from methane mitigation. The JDA memo does not illustrate any actual economic harm and should be considered only as an industry opinion piece.

We begin our peer review with some background on the economic analyses used by economists to examine the effects of regulations as well as how the peer review process works. We then offer our peer review of the JDA memo and the BLM Regulatory Impact Assessment (RIA) and evaluate whether the research is transparent, methodologically sound, and consistent with economic theory and the empirical evidence from the economic literature. We close with a short discussion section and conclusions.

Background

Conservation and the efficient use of natural resources should be a value held by conservatives and liberals alike. Methane pollution represents an inefficient use of a valuable resource. A principle of current welfare economics is that markets are efficient only if all market and nonmarket costs are fully

reflected in market price. However, market failure occurs when hidden, non-market costs, such as methane pollution, are not reflected in market prices. Markets fail to maximize net benefits when non-market costs such as air and water pollution exist. Climate change is an example of perhaps the greatest market failure in the history of the world (Stern 2006).

As noted by the BLM (2016):

When gas is wasted rather than captured and brought to market, society loses out on the ability to consume the resource and social benefits are not maximized. In addition, when the wasted gas in question comes from the Federal or Tribal mineral estate, the public or Tribes often lose royalty revenues. Additionally, state governments do not receive the compensation they are owed through royalty sharing from Federal production.

Wasting gas also produces air pollution, which imposes costs to society that are not reflected in the market price of the gas. Gas that is vented to the atmosphere or flared contributes greenhouse gas (GHG), volatile organic compound (VOC), and hazardous air pollutant emissions that have negative climate, health, and welfare impacts. These uncompensated costs to society are referred to as negative externalities.

Several market inefficiencies occur when society rather than the producer bears the costs of pollution damage. Since the damage is not borne by the producer, it is not reflected in the market price of the commodity, and uncontrolled markets produce an excessive amount of the commodity, dedicate an inadequate amount of resources to pollution control, and generate an inefficiently large amount of pollution. With stock pollutants, like methane and carbon dioxide, which build up in the environment and cause damage over time, the burden will be greater on future generations. Further, the fact that operators do not always bear the full costs of production introduces perverse incentives to the market. Operators that voluntarily make investments to limit or avoid the loss put themselves at a competitive disadvantage in relation to operators who do not make such investments.

The BLM methane capture rule helps level the playing field for the oil and gas companies that are already doing their part to conserve our valuable natural resources and to reduce air pollution.

Polluter Pays Principle

The polluter pays principle is based on sound environmental economics and will lead to more efficient markets by internalizing non-market costs into responsible oil and gas development. The polluter pays principle (PPP) simply says that oil and gas companies will pay all of the direct market and indirect non-market costs of producing oil and gas. Internalizing environmental externalities is the main objective of the polluter-pays principle. Economists believe that only when external costs have been fully considered will firms act so as to prevent market failures and move to a socially optimal level of output. Under the polluter pays principle (PPP) oil and gas producers will pay for the non-market costs of the environment and social damages that occur as part of their business operations. Payments are made in many forms, including royalties, severance taxes, compliance costs, pollution taxes, assurances bonds, and direct in-kind services for the repair of roads.

Benefit Cost Analysis

When evaluating the pros and cons of environmental regulations, economists traditionally complete a benefit cost analysis. Benefit cost analysis is a standard economic tool for comparing the market and non-market benefits of regulations with the costs that must be incurred to secure those benefits. Economists use benefit cost analysis to examine whether oil and natural gas production results in the largest possible benefit for society – or optimal economic efficiency. As Field and Field (2009) point out, “Benefit-cost analysis is for the public sector what a profit-and-loss analysis is for a business firm” (p. 118). Economic efficiency takes the perspective of all of society, and examines all the costs and benefits associated with oil and natural gas production, including non-market values. Benefit cost analysis does not include an examination of distributional market impacts such as employment and regional output.

Economic Impact Analysis

Economic impact analysis is a completely separate analysis from benefit cost analysis as it attempts to estimate the distributional impacts (i.e. jobs) from the additional (marginal) economic contribution a given investment, policy or project may make to the existing economy. Economists rely on an Input-Output (I-O) framework to estimate the jobs associated with oil and gas development as part of an economic impact analysis (or economic contribution analysis). I-O frameworks used in economic models such as IMPLAN and REMI are used to estimate the direct, indirect and induced jobs associated with changes in oil and gas policies. Direct jobs are created by direct hiring to perform the activity (i.e. drilling); indirect are jobs created by spending to support the work of direct jobs (e.g. pipe used by drillers to drill wells); and induced jobs are created when direct and indirect job holders spend their wages. So, jobs in the drilling pipe industry are indirect jobs, while bar and restaurant workers are induced jobs. While economic impact analysis is a common tool for estimating jobs, decision-makers would do well to better understand the assumptions and limitations of the I-O framework behind the studies.

Benefits and Costs are Estimated Separately from Economic Impacts

Why do economists keep distributional impacts (i.e. jobs and revenue) separate from benefits and costs? Benefit cost analysis takes a national accounting perspective. The benefits of the BLM methane capture rule, for example, flow to all Americans regardless of where they live. From a national accounting perspective, the job losses and gains are not considered because they tend to be a zero-sum game -- that is jobs created in one region are offset by jobs lost elsewhere in America. There is no net gain to American society when public policies simply transfer economic activity from one location of the country to another (Loomis 1993). If for example, high cost marginal wells do get shut down as a result of the methane capture rule, the jobs lost will be offset by job gains in the solar and wind industry or in areas where new drilling for more productive wells occurs. Industry is currently sitting on millions of acres of public land that under lease but are not producing oil or gas. In other words, industry has ample supply of drilling opportunities to replace any lost output and jobs, if in fact high cost marginal wells do shut down.

Peer Review Process

When economists and scientists peer review a paper, they provide a critical assessment of the research presented in the article. Reviewers are charged with carefully evaluating the quality of the manuscript, checking for accuracy, assessing the validity of the research methodology and procedures, identifying biases, and suggesting revisions. If reviewers find the article lacking in scholarly validity and rigor, they reject it.

In order for scientists to peer review a paper, the study's assumptions, data and methods must be transparent, well designed and presented clearly. Peer reviewing articles can be a rigorous process for an author. The peer review process from The Society of Petroleum Engineers (2017) include the following criteria that a paper must meet to get published:

- 1) It should be logically sound, and it should give sufficient detail to allow the reader to replicate the work it describes and to assess its applicability to other environments.
- 2) The research design, methods, and analyses are adequately defined and clearly described, well-integrated, well-reasoned, and appropriate to the aims of the project.
- 3) Statistical tests are appropriate and the assumptions underlying the use of statistics are fulfilled by the data.
- 4) The statistics are reported correctly and appropriately.
- 5) It should present clearly and concisely in SPE's standard format all relevant data and information to support the conclusions and to indicate their limitations.
- 6) The amount of data presented is sufficient and appropriate.
- 7) Results are presented effectively; the interpretations of the results are appropriate and the conclusions accurate. The study limitations are discussed.

The goal of peer review is to assess the quality of analyses and to ensure the integrity of science by filtering out and eliminating invalid or low-quality research. We rely of the above criteria from the Society of Petroleum Engineers as guidance for our review the JDA memo.

We Reject the JDA Memo Based on Review Criteria

Based solely on the criteria listed above from the Society of Petroleum Engineers, we would reject the JDA memo for not meeting the criteria. The JDA memo is not logically sound, nor does it provide sufficient detail to allow the reader to replicate the work. The research design, methods, and analyses are not adequately defined. Background theoretical assumptions are missing. Relevant data and information are also absent and therefore cannot support the conclusions. The interpretations of the results are not appropriate and the conclusions inaccurate. Finally, the authors did not discuss any of the study's many limitations.

The JDA Memo is fundamentally flawed because its analysis cannot be checked or replicated—JDA did not cite to any dataset, detail any of the assumptions for its economic model, or provide its methodology. For example, the JDA Memo states that based on “JDA's dynamic model of the oil and natural gas industry, it is likely that as many as 4,700 fewer oil wells would be undertaken as a result of the rules,” but the authors provide no supporting evidence for this assumption.

Without providing any supporting analysis, economic rational, or citations to data, the JDA memo further asserts that approximately 112 million barrels of oil will not be produced due to the compliance costs of the Rule. The JDA memo uses the estimated lost output and associated state and federal taxes, including estimated indirect and induced effects, as the basis for claiming \$1.26 billion in compliance costs. These claims have been repeated by industry groups (Loper 2017). In stark contrast the BLM estimated \$110-\$279 million in compliance costs – much less than the JDA estimate.

The series of logical leaps, untethered to clear assumptions or methodology, produces JDA's exaggerated estimate of compliance costs. Because of the lack of transparency in data and questionable methods, the \$1.26 billion in costs cited by industry groups should be summarily rejected by the public

and federal decision makers. JDA overstates compliance costs because the memo: 1) ignores the exemptions and phase in requirements included in the BLM Rule; 2) mistakenly includes alleged distributional impacts with compliance costs; 3) ignores the jobs and revenue produced from capturing methane by sealing leaks; and 4) relies on a single low price rather than using a range of prices. We discuss each of these the factors below.

In contrast to the JDA memo, the data and methods used by BLM to determine compliance costs and compare them to benefits are transparent and sound. BLM properly assigned dynamic market prices to calculate the value of the methane captured due to the Rule. After including societal benefits, BLM correctly concluded that the benefits of the Rule exceed compliance costs. The RIA is transparent with the data, assumptions, and methods used to derive BLM's results. BLM's analysis of compliance costs is likewise reasonable, and BLM rightly found that these compliance costs are very modest and would not have a significant impact on a substantial number of small entities. Overall, the BLM's methane capture rule is an improvement in economic efficiency at both the national and regional levels.

BLM Compliance Costs are Small and Reasonable

JDA asserts that the compliance costs of the Rule are higher than estimated by BLM in the regulatory impact analysis ("RIA") and assumes that additional regulatory compliance costs will significantly slow the pace and scale of oil and gas development. However, the data and methods used by BLM to determine compliance costs and compare them to benefits are transparent and sound. The BLM found that these compliance costs are very modest and are unlikely to drive operator decisions to shut-in wells. For example, the RIA specifically examined the compliance cost of the rule on small entities by performing a screening analysis for impacts on a representative sample of 26 small companies and analyzing the potential effect on profit margins. BLM estimated the Rule's projected compliance costs would reduce the small entities' profit margin, on average, by 0.15 percentage points. Based on this information, BLM reasonably concluded that the Rule would not have a significant impact on a substantial number of small entities (BLM 2016).

The results of the RIA—both with respect to the small magnitude of compliance costs and their effects on covered entities—are consistent with the recent oil and gas rulemaking in Colorado, which has comparable requirements. Colorado regulators estimated the net cost to the oil and gas industry to implement the new rules would be \$42.4 million per year, representing approximately 0.4% of industry's annual revenues (Colorado Air Quality Control Commission 2014). The Commission concluded: "Given this small percentage, the Division's proposal is unlikely to have any appreciable impact on the economic competitiveness of the industry as a whole. This conclusion is bolstered by the fact that several of the largest oil and gas companies in the state (Anadarko Petroleum Corp., Noble Energy, Inc., Encana Oil and Gas USA, and DCP Midstream) fully support the Division's proposed revisions."

Moreover, compliance costs are expected to decrease over time. Evidence from Encana in the Jonah field of Wyoming shows declining inspection costs as methods are improved, underscoring the potential benefits from technological gains in leak detection (Encana 2014). As these detection costs decrease over time, operators will benefit from efficiency gains by complying with the BLM methane capture rule. The rule compliance costs are unlikely to affect overall industry production as they are small and will be counteracted by increased revenue coming from newly marketed gas. We agree with BLM's findings of minimal effects on overall production from rule compliance – as it is consistent with the economic literature and the findings of our own research.

Morton and Hjerpe (2016) conducted a case study of two counties in the San Juan Basin of northwest New Mexico to better understand regional impacts of the BLM's proposed methane capture rule. Despite industry claims that states are already enacting these rules and that the Rule is duplicative, New Mexico is a prime example of a state in need of greater methane capture on Federal, Tribal, and State lands. Given that New Mexico is the literal "hot spot" of this controversy and to best understand the impact of the rule, we examined existing marginal wells where companies have the slimmest profit margins.

Our analysis included: 1) a Net Present Valuation of the costs of complying with proposed LDAR requirements and the new revenues from the methane captured; and 2) estimated change in overall gas production and associated royalty payments to the federal estate and the state of New Mexico. Our study examined 13,493 active federal gas wells in these two counties and determined that 8,718 (65%) of these wells produced less than 90Mcf per day. Our results indicate that by complying with the Rule, the majority of marginal gas wells will not only reduce methane emissions and natural gas waste, but by capturing the methane for sale, production, revenues, royalties and profits will also increase.² These findings are consistent with the economic literature and with the BLM's findings in the Regulatory Impact Analysis (BLM 2016).

By capturing the methane revenue earlier in time the economic return from compliance will increase along with corporate social responsibility – both of which can attract investors. Simply put, the BLM methane capture rule is an economic opportunity waiting to happen for the oil and gas industry, and in return the public will get cleaner air and increased tax revenue.

BLM has Phased in Rule Compliance to Mitigate Impacts

In addition to small compliance costs, the BLM provide operators with additional measures whereby the standards are phased in over time, with most of the Rule's requirements not necessitating compliance until January of 2018, limiting the need for immediate capital expenditure. For example, the Rule requirements for storage vessels, pneumatic controllers, and leak detection and repair ("LDAR") all allow operators up to one year from when the Rule becomes effective on January 17, 2017 to implement new standards. For storage vessels, operators must determine potential for emissions after the Rule becomes effective, but then have until January 17, 2018 to expend capital to bring covered vessels into compliance, or even longer (until January 17, 2020) if the storage vessel is scheduled for replacement.

With respect to pneumatic controllers, operators have until January 17, 2018 to replace faulty devices, and the Rule effectively exempts wells or facilities with a remaining productive life of three years or less from the requirement. Similarly, the LDAR provisions give operators until January 17, 2018 to begin making inspections for leaks for sites that have begun production before January 17, 2017, and give operators 60 days to begin inspections for sites newly producing after the Rule's effective date.

BLM has Provided Exemptions to Further Mitigate Impacts

The BLM also included express exemptions in the Final Rule aimed at mitigating the distributional impacts from implementing the rule. Provisions in the Rule include exemptions to allow operators to

² We estimated the economic effect of the methane rule on San Juan Basin royalties to the state of New Mexico using 3 market scenarios. The results for all scenarios indicates that complying with the methane rule would have a small, positive effect on production and royalties in the San Juan Basin. Many other variables have much greater economic effect on the financial analysis and operating decisions of wells. As such, we view the methane rule's overall effect on the number of wells to be negligible in the San Juan Basin, and positive for overall production.

avoid compliance if doing so would otherwise result in loss of substantial amounts of recoverable oil, or in some cases, are “unduly costly.” As the Final Rule states, the “final rule requires an operator to make a demonstration that each requirement for which the operator is requesting an exemption would itself cause the operator to cease production and abandon significant recoverable reserves on the lease.” Thus, if any operators would otherwise be forced to shut-in wells, abandon significant recoverable reserves, or face undue costs, these operators could seek exemption from the Rule and the claims of economic loss or deferral of production would not occur.

The BLM can adjust capture target requirements if the “operator on an existing lease that demonstrates to the BLM that meeting the target would impose such costs as to cause the operator to cease production and abandon significant recoverable oil reserves under the lease.” The BLM may also provide an exemption from many of the other equipment standards in the rule if the operator demonstrates that replacement of equipment “would impose such costs as to cause the operator to cease production and abandon significant recoverable oil reserves under the lease.”

JDA Confused Distributional Market Impacts with Benefits and Costs

As discussed above benefits and costs are completely different than distributional impacts and should be analyzed separately. The authors of the JDA memo committed one of the most egregious economics mistake out there: they have confounded distributional market impacts (output, income, jobs) with societal costs and benefits of the Rule. This is a critical flaw and an incorrect economic representation of reality.

Distributional effects are the anticipated changes in regional and sectoral employment, output, income, and taxes. Economists call distributional effects “economic impacts.” Economic impacts are market-based indicators of national and regional effects stemming from a new rule. Changes in distributional effects, or economic impacts, are neither costs nor benefits to society and the nation.

Costs and benefits in economic efficiency analysis (i.e. benefit cost analysis), on the other hand, are economic values associated with the compliance costs and revenue generated, along with subsequent societal costs and benefits from implementing the rule. The alleged lost output in oil and gas sectors by JDA should not be confused with or added to compliance costs and benefits. Following standard economic theory, BLM correctly and separately evaluated market impacts as distributional effects in the RIA.

By law, the BLM must analyze the economic efficiency of rulemakings in Regulatory Impact Analyses (RIAs). As the BLM is a federal agency, tasked with the stewardship of America’s public lands, they have to analyze the economic efficiency of new rules by determining the overall costs and benefits to the nation’s taxpayers. That is, do the national benefits of the rulemaking outweigh the national costs of the rule? The benefits for the Methane Rule include increased royalties to the public from newly captured natural gas, along with avoided damages to society from a reduction in pollution from oil and gas development. The costs include the increased private sector costs necessary to comply with the new rule as well as the damages from any increase in carbon-dioxide.

The BLM conducted a rigorous and economically sound Benefit/Cost Analysis (BCA) for the Methane Rule, finding that the benefits of the rule far outweighed the costs. The BLM also separately examined distributional effects (economic impacts) in the final RIA for the Methane Rule, finding that the rule would have a minimal effect on overall national and regional employment, income, output, and taxes.

The JDA memo, on the other hand, presents a straw man argument. JDA's conflation of changes in jobs and output with costs and benefits of the Rule, is a critical flaw of their memo. While we are unsure if they really do not know the economic methodological differences between benefit/cost analysis and distributional economic impacts, or if they knowingly mixed these two economic methods, we are sure that their analysis is an improper assessment of the BLM's Methane Rule.

The JDA memo criticizes the BLM's BCA, and offer their own estimates of costs and benefits associated with the Rule. In presenting their own costs, JDA analysis uses the BLM's estimate of \$174 million (from draft RIA) in compliance costs. Then, they state "JDA estimates an economic impact on jobs, wages, and lost output of \$997,199,000. Additionally, those economic losses create an additional loss of \$114,112,000 in federal and state taxes." Inexplicably, they combine these purported distributional economic impacts with compliance costs of the rule to ascertain a \$1.26 billion "cost" of the Rule.

First, JDA's estimate of economic impacts (wages and output) from the Rule are extremely inaccurate as there is no acknowledgement of jobs and output that will be created in leak detection, monitoring, and gas capture. JDA failed to look at the net employment effect of the rule.

Secondly, bundling assumed lost wages and output into "costs" and presenting these in their own BCA is a critical failure in economic analysis. On page 11, JDA states, "All told, the economy could lose as much as \$977.2 million in overall economic output annually." This quote represents a very serious misunderstanding of how the economy works in real life and why economists have rigorous methodological theories that properly depict the net effect of policy changes throughout the economy. It suggests that wealth not invested in oil and gas will forever remain lost to the U.S. economy. These misrepresentations could not be further from the truth. Rather, investment and labor will flow to help capture previously lost gas, will flow to renewable energy, and will flow to technical services used to help reduce pollution in oil and gas development.

Finally, the purported lost jobs and output (\$977.2 million) is even more fictitious than first meets the eye, because only about half of this amount (\$539 million) is the estimated direct effect in the oil and gas industry. Of that total, \$438 million of the alleged lost output is actually secondary effects in sectors that indirectly support the oil and gas industry (e.g., road construction) and sectors that have an induced effect (e.g., restaurants serving oil and gas employees). Not only does JDA assume that lost oil and gas output will be forever lost in the national economy (which of course, it will not be), but they compound their mistake by assuming that the waitress and banker utilized by oil and gas workers will also become permanently unemployed.

To illustrate the breakdown of the conflated JDA claims of economic harm we summarize these cost claims in Table 1.

Table 1: Breakdown of JDA Alleged Rule “Costs” of \$1.26 Billion

JDA Estimated Cost	Amount (million)	Actual Economic Description	Comments
Output (Direct Effect)	\$539	Economic Impact	Excludes increased output from captured gas and new leak detection jobs
Output (Indirect and Induced Effects)	\$438	Secondary Economic Impact	Excludes increased secondary output from captured gas and new leak detection jobs
Taxes	\$114	Economic Impact	Excludes new taxes from increased gas sales.
Compliance Costs to Operators	\$174	Cost in Cost/Benefit Analysis	Same as high end BLM estimate.

JDA Ignored the Jobs Created by Implementing the Rule

The oil and gas industry has a long history of ignoring the jobs created from regulations. The JDA memo, for example, ignored the jobs created by an increased emphasis on monitoring, detecting and fixing leaks at the wellhead. Claims of job losses fail to account for the fact that compliance with the rule will generate additional revenues due to increased capture, and likewise will generate employment in areas needed to demonstrate compliance with the rule, including new engineering, consulting, and gas gathering jobs.

We fail to see how an objective analysis of economic impacts of the Rule should not also include the jobs and output that will be generated in local businesses conducting leak detection and repair, adding gas capture infrastructure, and the positive economic impacts that stem from increased capture of currently leaked, vented, or flared gas. It is important to present and understand *net* economic effects, as opposed to isolating one or two speculative effects on which to base an entire claim. Based on transparent data and methods used by the BLM, we believe the Rule will have a neutral or positive effect on employment and a positive effect on taxes and royalties.

JDA Impacts are Projected Impacts Not Actual Impacts

Claims that the Rule will lead to adverse effects on industry employment, taxes, and royalties are speculative and without economic merit. As such they truly represent “fake news.” The oil and gas industry and their consultants have produced dozens of reports that conclude the “sky will fall” if environmental regulations are enforced, drilling setbacks increased, or areas are put off limits from drilling. These studies typically use the IMPLAN model to project job and revenue losses as a result of environmental regulations. The authors assume a decrease in drilling and production and the model then estimates the change in jobs and revenues. It is important to note that the job and revenue losses are entirely based on the assumptions used by the authors to run the IMPLAN model.

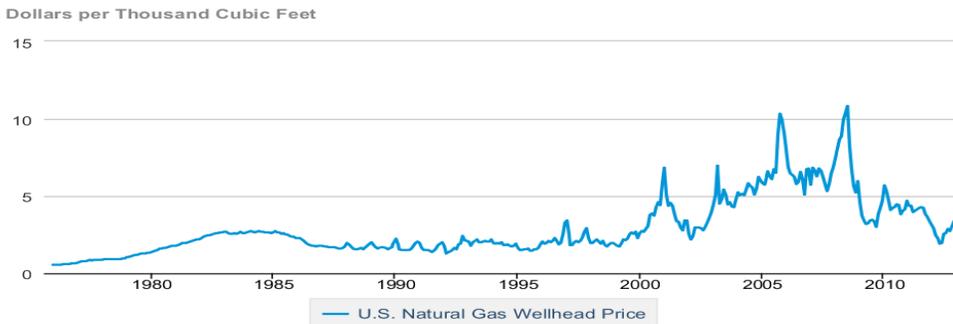
To our knowledge, industry rarely if ever cites peer reviewed published studies that use actual data on job and revenue changes to support their erroneous claims. For example, economic studies that “backcast” and look at actual historical data of jobs and revenue, to statistically examine the actual impacts from environmental regulations would provide more solid support for their claims, then studies that simply forecast impacts. There are 40 years of economic research confirming that industry claims of job and revenue loss are unsupported by actual data

(Appendix A). Perhaps that is why industry continues to rely on consulting reports that only forecast job and revenue losses, rather than publishing supporting papers in peer review journals based on actual data.

The BLM Correctly Modelled a Dynamic Market

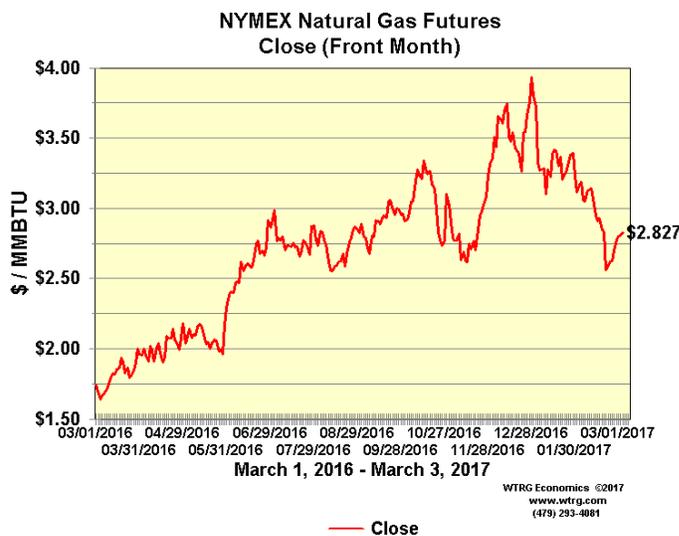
Oil and natural gas markets are not static, rather they are dynamic – with prices changing all of the time. The following graph shows the increasingly volatile and dynamic nature of natural gas prices in the last 20 years (Energy Information Administration 2017).

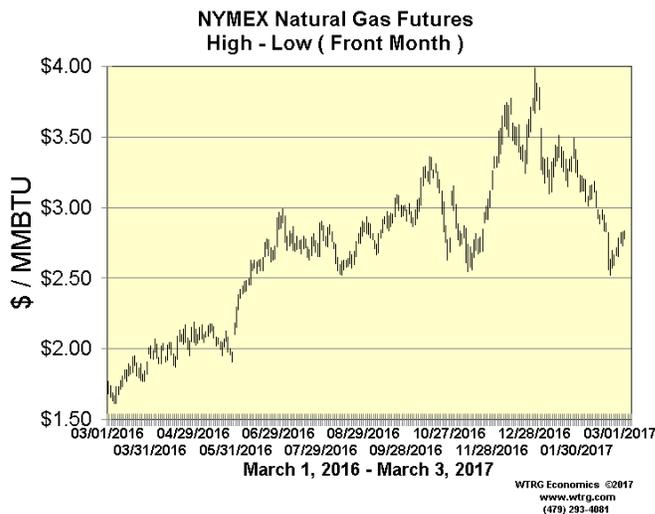
U.S. Natural Gas Wellhead Price



Source: U.S. Energy Information Administration

To compensate for market dynamics, a rigorous economic analysis uses a range of prices over time when estimating the impact from a regulation. The JDA memo unfairly critiques the BLM’s estimate of benefits of additional gas capture, by suggesting that they should not have used dynamic market prices into the future, but rather benefits for newly captured gas should be based on a single natural gas price. The following graphs illustrate the volatility in natural gas prices since the Dunham memo was released (WTRG 2017). The increase and subsequent decrease in natural gas prices illustrates that energy markets are not static, as assumed by JDA.





Conversely, the BLM properly modelled a dynamic natural gas market by allowing prices to change over time. Consistent with rigorous economic analysis, BLM used a range of resource values based on projections of oil and gas prices over time in its benefit cost analysis. Table 2, reproduced from the Final BLM RIA Table 7-5, shows the natural gas prices used in the analysis.

Table 2: Crude Oil and Natural Gas Price Forecasts, 2017 – 2026

Year	EIA Forecast – Crude Oil – West Texas Intermediate Spot (\$/bbl)	Crude Oil Price Used in this Analysis (\$/bbl)	EIA Forecast – Natural Gas – Spot Price at Henry Hub (\$/Mcf)	Natural Gas Price Used in this Analysis (\$/Mcf)
2017	48.08	47.12	3.19	2.39
2018	51.53	50.50	3.73	2.80
2019	64.24	62.96	4.14	3.11
2020	71.12	69.70	4.58	3.43
2021	75.37	73.86	4.47	3.35
2022	78.71	77.14	4.49	3.37
2023	81.06	79.44	4.89	3.67
2024	82.93	81.27	5.16	3.87
2025	85.41	83.70	5.29	3.97
2026	88.40	86.63	5.15	3.86
2027	92.96	91.10	4.95	3.83
2028	95.33	93.42	5.00	3.87
2029	97.06	95.12	5.05	3.91
2030	100.28	98.28	5.06	3.91
2031	103.50	101.43	5.01	3.88
2032	106.81	104.68	5.03	3.90
2033	110.31	108.11	4.98	3.85
2034	112.45	110.20	4.96	3.84

2035	116.14	113.81	4.91	3.80
2036	118.35	115.98	4.90	3.79
2037	122.09	119.64	4.84	3.74
2038	124.95	122.45	4.78	3.70
2039	129.11	126.52	4.85	3.75
2040	92.96	91.10	4.86	3.76

Current prices for both oil and gas are higher than the 2017 prices used by the BLM. The future price scenarios used by the BLM represent the price environment that EIA projects that operators will likely experience in future years when compliance requirements actually take effect.

JDA Ignored Revenue from Capturing Methane

Regardless of the assumed price, when leaks at the wellhead are plugged and the additional methane is sold – revenue is generated. Quite simply, natural gas captured and sold in the market place has a value greater than zero. Unfortunately, the JDA memo ignored revenue generated by the Rule by erroneously assuming zero value for all captured natural gas. A key assumption in the JDA memo is that the natural gas market is so flooded with excess supply that any methane captured as a result of the Rule has virtually zero economic value, and hence will not produce any revenue to cover the compliance costs. This is simply not true—natural gas sold, whether produced by a well or captured by fixing leaks, will have a marginal value equal to the market price for natural gas.

We question how JDA can assume on the one hand that undeveloped oil and gas in the ground can generate so much revenue as to spur almost a \$1 billion of output; but on the other hand, assume that natural gas captured due to Rule compliance has a price of \$0 and would not generate any revenue. A meaningful portion of the estimated 111 Bcf of annual gas vented and flared on Federal and Indian leases is likely to be captured and brought to market under the Rule. This marketed new gas will generate significant revenue, or cost savings, for operators, which can spur substantial positive economic impacts in local jobs and regional output.

The oil and gas industry and their Congressional allies have a long history of just focusing on the costs of regulations while choosing to ignore the jobs, benefits and revenue from the regulations. The JDA memo is just the latest attempt to bias the policy discussion by only looking at one side of the ledger.

Unfounded Claims that the Rule Will Cause Loss of Taxes or Royalties

Claims of economic harm in terms of lost state and federal taxes and royalties are speculative and are unlikely to occur. The JDA memo assumes that the Rule will stifle overall production, resulting in correlating reduced oil and gas output and employment. However, they completely ignore the increased production that will occur under new capture rules. As described above, it is unlikely that the BLM Rule will have a negative effect on oil and gas production. When accounting for the output and jobs that will be spurred by the Rule, in terms of equipment installation and increased marketable production, both state and federal taxes and royalties are likely to increase and not decline. In cases of deferred production, royalties and taxes will be generated at the time production resumes. On the other hand, waste of oil and gas represents a permanent loss of royalties. It is important to note that any claims of lost royalties from deferred production should consider the future economic impact of these deferred royalties.

Discussion and Conclusion

The JDA memo suffers from numerous critical flaws. The JDA memo wrongly assumes that the methane capture rule will stunt overall production without providing any supporting data or methods. It overlooks the exemptions and phase in requirements included in the Rule. JDA does not consider net effects as it ignores the methane mitigation jobs and revenue created by implementing the Rule. JDA relied on a single price for natural gas that is lower than current prices and ignores the dynamic nature of energy markets. JDA incorrectly confounds speculative distributional impacts (i.e. jobs) with costs and benefits to the nation and the public taxpayer. In general, the JDA memo fails to consider the net effects of the Rule, but rather just posits that regulation will infringe upon their status quo. This is akin to balancing a checkbook by only entering income, but forgetting to enter expenditures. Given the one-sided perspective of the JDA memo, we recommend the conclusions be disregarded in discussions of the BLM's Methane Rule.

Congressional leaders who are actually concerned about creating millions of American jobs, should be endorsing the BLM methane capture rule. Industries vary in the degree to which a dollar of expenditures is allocated to hiring workers (labor) or buying machines and paying back loans (capital). In general, oil and gas corporations are capital intensive and have low employment multipliers. In contrast, the wind and solar energy industry and companies carrying out energy conservation measures -- manufacturers of electrical equipment or the construction jobs associated with home or office weatherization programs -- are labor intensive and have high employment multipliers.

Labor intensive businesses with higher multipliers generate more jobs per dollar invested by producers, consumers, or the government. If marginal wells are shut in and closed, and investment flows to renewable energy and energy conservation – the shift in investment will create more jobs than similar investment in oil and gas. As Laitner et al. concluded in 1998:

...the shift in spending patterns away from fossil-fueled-based energy supply sectors has an inherent employment enhancing effect.... since these traditional energy supply sectors are substantially less labor-intensive than the rest of the U.S. economy and one of them (petroleum) is heavily import-dependent.

Rather than a continued emphasis on facilitating more oil and gas drilling, Congressional leaders should embrace the Rule -- in addition to similar policies centered on improving energy efficiency, alternative energy and conservation – all of which have the potential to generate significantly more jobs and protect the environment.

Broadly, the current debate between protecting our environment versus generating jobs is presenting American's with a false choice. Forty years of economic research indicates that we do not have to choose jobs over the environment. Environmental protection goes hand in hand with sustainable economic development. And there is absolutely no reason in this day and age that American citizens cannot have clean air, clean water and a job. The BLM's methane capture rule is a very positive step toward that economic reality.

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Appendix A: Environmental Regulations, Job Creation, and Corporate Social Responsibility

Victor Hugo (1851) is famously quoted for stating, “Nothing is more powerful than an idea whose time has come.”³ It is long past the time to recognize the powerful idea that regulations that protect human health and our global environment create jobs and healthy communities -- and are prerequisites for sustainable economic development. Forty years of empirical data supports this powerful idea.

In a study published in the *Journal of Economic Literature*, Jaffe et al. (1995) examined two decades of research looking for a negative impact from environmental regulations and concluded: “studies attempting to measure the effect of environmental regulations...have produced estimates that are either small, statistically insignificant, or not robust to test model specifications.” Morgenstern et al. (2000) concludes, “While environmental spending clearly has consequences for business and labor, the hypothesis that such spending significantly reduces employment in heavily polluting industries is not supported by the data.”

These retrospective results are consistent with the “Porter Hypothesis” offered by a Harvard business professor. According to Porter (1991) and Porter and van der Linde (1995), environmental regulations provide firms with an incentive to innovate and develop more cost-effective methods of achieving regulatory compliance. As a result of investing in innovation, companies may also discover new technologies that reduce both pollution emissions and production costs.

Regulations that are designed to push technological innovation and increase productivity will help offset the costs of regulations and in some cases, can actually lead to increased profits. The basic idea is that with technological change, the near-term costs of regulation can be offset in part or in full, if in the long term environmental regulations stimulate innovation and increase productivity (Brannlund and Lundgren 2009). Ambec et al. (2011) in a 20-year retrospective found solid support for the Porter Hypothesis.

In total, there is now more than 40 years of empirical economic research indicating that environmental regulations have not resulted in significant job losses, rather regulations can actually create jobs and spur technological innovation. We reviewed three peer-reviewed publications of regulatory impacts and the oil and gas industry and all three papers showed support for the Porter Hypothesis. In a peer-reviewed study of environmental regulations and oil refineries, Berman and Bui (2001) found that in meeting more stringent environmental standards, oil refineries in the Los Angeles air basin actually increased their productivity and efficiency. The increase in productivity was a result of “a careful redesign of production processes induced by the need to comply with environmental regulations.” A second study using data from offshore oil and natural gas production in the Gulf of Mexico, found that environmental regulation did in fact induce technological change in the oil and gas industry (Managi et al. 2005).

A third study by Ford et al. (2014) found support for the Porter Hypothesis and the traditional top-down view of oil and gas regulations in Australia. Their results reveal that a high regulatory burden relates

³ The quote is attributed to Hugo’s 1851 book titled “History of a Crime” which is his account of the French coup d’état of 1851 that brought Napoleon III to power. The literal English translation of the sentence is: “One can resist the invasion of armies; one cannot resist the invasion of ideas.”

<https://www.translatum.gr/forum/index.php?topic=323933.0>

strongly to product and service innovations as well as all types of novel innovations. Ford et al. (2014) found that technological innovation is simultaneously related to a high regulatory burden and the presence of competitive capabilities, collaborative activity and research and development (R&D). According to their economic model, it is the presence of all of these factors in tandem which explain technological innovation in Australia's oil and gas industry.

The results from two additional studies are relevant to the oil and gas industry. Hart and Ahuja (1996) found a positive relation between emission reductions and firm performance. The biggest bottom line benefits accrue to the 'high polluters' where there are plenty of low-cost improvements to be made. Their results suggest that the marginal costs of reducing emissions seldom exceed marginal benefits. Also of interest is a recent study by Lucas, M.T and T.G Noordewier (2016) that asked the question "What are the circumstances under which it might pay to be green?" Among the results, the authors found that within dirty and non-proactive industries there is a positive marginal effect on firm performance as a result of engaging in environmental management practices. Moreover, the effect on financial performance of implementing environmental management practices is greater in relatively dirty and non-proactive industries than in relatively clean and proactive industries.

Despite these examples, the oil and gas industry has been somewhat reluctant to embrace change by investing in technological innovation. As summarized by Perrons (2014):

Future oil and gas resources—especially in non-OPEC countries—will tend to be deeper, harder to find, and in environments that are significantly more difficult to access than they used to be (Managi et al. 2004, 2005b; Hinton,2010). Second, high- profile disasters... like the recent Deepwater Horizon accident (Flournoy, 2011; Perrons,2013) have brought about a marked change in the expectations placed upon oil and gas companies with regard to environmental stewardship, safety, and human welfare (Mirvis, 2000; Managi et al.,2005a; Hofmeister,2010). In the face of these kinds of challenges, technology will clearly play a pivotal role in the success or failure of tomorrow's oil and gas firms (Longwell, 2002; Mitchell et al.,2012). Despite the strong case for technology, however, the industry has a reputation for being slow to develop and adopt innovations...

The sector has accordingly been characterized in the literature as "slow clock speed" (Fine, 1998, p.239), "low-and medium-tech" (von Tunzelmann and Acha,2006, p. 408), and "technologically timid" (Lashinsky,2010, p.88). Oil & gas producers have also been categorized as "low R&D intensity" because they have historically invested less than 1% of their net revenue in research and development (R&D) (von Tunzelmann and Acha, 2006; Moncada-Paternò-Castelloetal.,2010).

The treatment of technological change is increasingly recognized as an important variable when estimating the benefits and costs of environmental regulations (e.g. Gillingham et al. 2008). We find the BLM's revised rules for capturing methane to be well designed to spur continued technological innovation in the oil and gas industry. And capturing more methane leads to increasing productivity. The challenge presented by the BLM's methane capture rule offers the oil and gas industry an opportunity to alter its approach by embracing the technological innovation necessary for capturing methane and reducing air pollution.

Those who claim that environmental regulations result in significant job loss, high costs, and the flight of industry to “pollution havens” are not supported by reviews of economic research (Meyer 1999; Berman and Bui 2001; Morgenstern et al. 2002; Ackerman 2006; Cole and Elliott 2007). Since 1970, economists have been searching for the competitiveness impacts of environmental regulations and in general have found very little evidence of any measurable negative impact (Goodstein 1999). Morgenstern et al. (2000) conclude that environmental regulation is just as likely to create jobs as to cause job losses. With this conclusion in mind, consider the powerful idea that the BLM methane capture rule could result in a net increase in jobs.

Richard Behan (1992), former Dean of the Forestry School at the University of Northern Arizona, took Victor Hugo’s quote and turned it around to reflect the powerful institutional and industry resistance that rises when change to the status quo is needed. Behan said, “Nothing is so powerful as an idea whose time has passed”. The time has long passed for the idea that the BLM is going to continue to let the oil and gas industry waste our valuable natural resources and pollute our air and water. In line with Behan’s quote, the oil and gas industry wants to stay in control and cling to the past by strongly opposing the BLM methane capture rule. Industry is opposing the rule while blindly ignoring facts on air and water pollution -- and any resemblance of social corporate responsibility.

The oil and natural gas industry has much to gain by embracing the BLM’s methane capture rule rather than fighting it. By aggressively supporting and adopting the requirements from the methane capture rule, industry will help do its part to protect the environment which generates corporate goodwill and will improve its overall corporate social responsibility.

Margolis, Elfenbein, and Walsh (2007) completed a meta-analysis of 167 studies and found that “After thirty-five years of research, the preponderance of evidence indicates a mildly positive relationship between corporate social performance and corporate financial performance”. Beurden and Gossling (2008) reviewed 31 studies examining the relationship between corporate social performance (which includes environmental performance) and financial performance. The economists found 23 studies with a significant positive relationship and only two studies with a negative relationship between social and environmental performance and corporate financial performance. The authors conclude that the relationship between corporate social-environmental performance and corporate financial performance is primarily a positive one. This finding is consistent with previous reviews of the literature (Roman et al. 1999; Margolis and Walsh 2003; De Bakker et al. 2005).

Beyond a genuine desire to “do the right thing”, by embracing the methane capture rule the oil and gas industry will retain its social license to operate and gain the benefits that accrue to socially responsible companies. As oil and gas drilling has moved closer to populated areas and the damage becomes more visible, industry’s “social license to operate” has come into question. The concept of social license to operate comes from increasing consumer awareness and stakeholder groups that exert influence beyond the traditional governmental roles (Berkhout 2014). Neglecting social concerns can have drastic negative impacts on performance (Ford et al. 2014).

Potential benefits of improving corporate social and environmental responsibility include (Portney 2008):

1) Gain goodwill with current and future customers.

The oil and industry has gone from producing “clean burning” natural gas to “fracked” gas. As a result, natural gas specifically has suffered significant damage to its brand (Morton and Kerkvliet 2014). Both natural gas and oil are in need of a re-branding campaign. By embracing the BLM methane capture rule rather than gutting it, industry and its Congressional Allies will begin to repair their brand damage with the public as well as help the oil and gas industry maintain its social license to operate.

2) Be a good neighbor.

Volatile organic compounds from oil and gas development contribute to ozone pollution which exacerbates a range of health problems for local residents including respiratory illnesses and asthma (Pride et al. 2013). It makes little sense to allow a hazardous industry within community boundaries if kids and parents get sick and miss more work or school. By reducing air pollution and cleaning up the regional air shed, the oil and gas industry can build goodwill with the residents of nearby communities.

3) Relationship building.

Embracing the methane capture rule would help improve relationships with communities and the regulating agencies. In Australia, collaboration in regulation has led to technological innovation in the oil and gas industry (Ford et al. 2014). Building relationships with entrepreneurs creating jobs by starting companies that monitor and repair methane leaks has the potential to lower compliance costs and create jobs that are similar in nature to the job done by your local plumber.

4) Improve the bottom line.

Reducing waste and pollution by capturing more methane revenue can improve a company’s bottom line. The analyses in both the EPA and BLM regulatory impact analysis show this to be true.

5) Attract investors.

With the growth in socially responsible investing, companies go above and beyond what is required by law in order to attract potential investors. There is a growing movement afoot to disinvest in coal, oil and gas companies. And the exodus of capital has caused the share prices of many energy companies to decline. Going above and beyond current environmental laws could help attract investors back. Customers and utilities may be willing to pay more for natural gas and oil produced by good corporate citizens. Consumers in Colorado and elsewhere are strongly expressing their preference in the marketplace for cleaner, more responsible oil and gas development, and industry should respond to these market forces.

Natural gas has lost its credibility as a green fuel of choice and capturing methane pollution to produce revenue will help restore industry’s image amongst socially conscious investors. Capturing methane pollution and creating revenue and benefits is an obvious strategy for greening up our supply of natural gas. Socially conscious investors may be interested in investing in methane capture technology even if the rate of return is low. This is because in addition to revenue, investors get the non-monetary benefits associated with doing their part to internalize the social costs of air pollution into their investment decisions.