

RFF REPORT

PHMSA's 2009 Gas Distribution Rule

Should It Stay or Should It Go?

Alan J. Krupnick, Justine Huetteman, and Arthur G. Fraas

RFF Report Series: *The Costs and Benefits of Eliminating or Modifying US Oil and Gas Regulations*

AUGUST 2018



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This report is one in a series: The Costs and Benefits of Eliminating or Modifying US Oil and Gas Regulations.

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Executive Summary

The Trump administration has prioritized increasing the production of US oil and natural gas, in part through reducing federal regulatory burdens that the administration says restrict development. President Trump signed Executive Order (EO) 13783 in March 2017, requiring agencies to review existing rules, policies, guidance documents, and more that potentially burden the development or use of domestically produced energy resources. This EO also specifically identified for review regulations applicable to the oil and gas sector. EO 13771, which ordered that agencies must remove two rules for every new rule implemented, emphasized that cost-benefit analysis is required for all major regulations being considered for elimination or modification (as has been the practice for new regulations). But it also laid out the controversial requirement that only the cost savings from repeal be considered in prioritizing rules for repeal in that cost savings (and not forgone benefits or net benefits) be counted when complying with the two-for-one requirement. Ninety-six economists and experts expressed concerns about this requirement in a March letter to the Trump administration (Linn and Krupnick 2017).

Following these actions, we at Resources for the Future (RFF) sought to first catalog existing federal regulations promulgated after 2005 and non-regulatory federal activities of concern to the oil and gas industry.¹ We then turned toward understanding what the impacts on industry and the public might be if some of these regulations were eliminated, modified, or delayed. We analyzed these impacts by updating the parameters used in the original agency regulatory impact analyses (RIAs) and

assessing the cost savings and forgone benefits associated with repealing and modifying the following rules:

- the Bureau of Land Management’s (BLM’s) “Waste Prevention, Production Subject to Royalties, and Resource Conservation” rule, hereafter referred to as the BLM methane rule;
- the Environmental Protection Agency’s (EPA’s) “Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources New Source Performance Standards” rule, hereafter referred to as the EPA methane rule;
- the Bureau of Safety and Environmental Enforcement’s (BSEE’s) “Oil and Gas and Sulfur Operations in the Outer Continental Shelf—Blowout Preventer Systems and Well Control Rule”;
- the Pipeline and Hazardous Materials Safety Administration’s (PHMSA’s) “Hazardous Materials: Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains” rule, hereafter referred to as the tank car rule;
- BSEE’s and Bureau of Ocean Energy Management’s (BOEM’s) “Oil and Gas and Sulphur Operations on the Outer Continental Shelf—Requirements for Exploratory Drilling on the Arctic Outer Continental Shelf” rule; and
- PHMSA’s “Pipeline Safety: Integrity Management Program for Gas Distribution Pipelines” rule, hereafter referred to as the gas distribution pipeline rule.

¹ We will produce information about this catalog as part of a forthcoming document summarizing the results of the project.

This report analyzes PHMSA’s gas distribution pipeline rule,² which requires integrity management planning for gas distribution pipelines. The implementation of the rule as PHMSA calculated in the final RIA would lead to net benefits of \$159 million to \$1.6 billion (discounted at 3 percent) over 50 years, depending on the expected effectiveness of the rule, as shown in Table 1.

Our analysis updates relevant factors in the calculation of costs and benefits that have changed since the RIA was finalized, described in further detail in the body of this

report, resulting in a baseline estimate of the impacts of the rule that has much lower net benefits—negative net benefits of \$764 million based on a low estimate of effectiveness and net benefits of \$997 million based on a high estimate of effectiveness.

The Trump administration has not proposed repealing this rule; however, if the administration were to repeal the rule, we estimate net benefits of repeal of \$764 million or net costs of repeal of \$997 million, depending on the effectiveness of the rule, as shown in Table 1.

TABLE 1. SUMMARY OF ORIGINAL RIA AND BASELINE, TOTAL 50-YEAR NET BENEFITS, NET PRESENT VALUE AT 3% AND 7% DISCOUNT RATE (MILLION 2008\$)

3%					
KEEPING RULE					
	Costs	Benefits (Low)	Benefits (High)	Net Benefits (Low)	Net Benefits (High)
Original RIA	2,783	2,942	4,373	159	1,590
Baseline	2,690	1,926	3,687	(764)	997
REPEALING RULE					
	Costs Avoided	Benefits Forgone (Low)	Benefits Forgone (High)	Net Benefits of Repeal (Low)	Net Benefits of Repeal (High)
Using Original RIA Figures	2,783	2,942	4,373	(159)	(1,590)
Repeal Baseline	2,690	1,901	3,662	789	(972)
7%					
KEEPING RULE					
	Costs	Benefits (Low)	Benefits (High)	Net Benefits (Low)	Net Benefits (High)
Original RIA	1,618	1,639	2,437	21	819
Baseline	1,499	1,073	2,054	(426)	556
REPEALING RULE					
	Costs Avoided	Benefits Forgone (Low)	Benefits Forgone (High)	Net Benefits of Repeal (Low)	Net Benefits of Repeal (High)
Using Original RIA Figures	1,618	1,639	2,437	(21)	(819)
Repeal Baseline	1,499	1,059	2,040	440	(542)

² 74 FR 63906, “Pipeline Safety: Integrity Management Program for Gas Distribution Pipelines.” <https://www.gpo.gov/fdsys/pkg/FR-2009-12-04/pdf/E9-28467.pdf>.

Most of the report will focus on a number of scenarios that affect the costs and benefits of the rule. These were chosen to reflect uncertainty about various inputs to the RIA. We present benefit-cost calculations for one cost adjustment for this rule:

- adjusting the labor rate to grow over time

We present benefit-cost calculations for the following benefits adjustments for this rule:

- using a lower estimate of reduced lost gas
- valuing methane emissions reductions using a domestic social cost of methane
- valuing methane emissions reductions using a global social cost of methane
- adjusting the number of high consequence accidents
- varying the natural gas price over time
- adjusting for experience with the rule

Using our repeal baseline, we find that if the rule prevents only 20 percent of possible incidents (the low benefits forgone estimate), there are net benefits to society of repeal; however, if the rule prevents 50 percent of

possible incidents (the high benefits forgone estimate), there are net costs to society of repeal. We calculate that the break-even point of effectiveness of the rule (the point at which benefits forgone equal costs avoided) is 31 percent.

Because this rule results in substantial methane emissions reductions, we wanted to quantify the value of those reductions, which PHMSA did not do in the original RIA. Using a domestic social cost of methane yields the same qualitative conclusion as with the repeal baseline; however, using a global social cost of methane suggests that the rule has net costs of repeal under both low and high effectiveness rates. Given that the rule was promulgated nearly a decade ago, we are able to observe the realized effectiveness of the rule in preventing incidents, so we recalculate the effectiveness rate of the rule based on PHMSA incident data from 2010 to 2016. We find that if the rule continues to be as effective as it has been in its first seven years, repealing the rule would result in net benefits to society. However, combining multiple cost and benefits adjustments, including the valuation of methane emissions benefits and experience with the rule, we find that repealing the rule would result in net costs to society.

1. Introduction

The Trump administration has identified increasing oil and natural gas production as a priority for the United States, in part through reducing federal regulatory burdens that the administration says restrict development. President Trump signed Executive Order (EO) 13783 in March 2017, requiring agencies to review existing rules, policies, guidance documents, and related materials that potentially burden the development or use of domestically produced energy resources.³ This EO also specifically identifies for review those regulations applicable to the oil and gas sector.

The Trump administration has also focused on reducing regulatory costs across the federal government more broadly under EO 13771, which ordered that two regulations be removed for every regulation implemented.⁴ Subsequent guidance from the Office of Management and Budget (OMB)⁵ for implementing EO 13771 emphasized that cost-benefit analysis is required for all major regulations being considered for all major regulations being considered for elimination or modification (as well as for new regulations). But it also lays out the controversial requirement that only the cost

savings from repeal be considered in prioritizing rules for repeal as well as in scoring against the costs imposed by new regulations.⁶

2. Objectives

The goals of our project were to catalog the regulations that may be reviewed by the Trump administration⁷ and select several to analyze in-depth, conducting a cost-benefit analysis to estimate the potential impacts on industry and the public if the regulations are eliminated, modified, or delayed. These impacts would include cost savings and forgone benefits associated with changes to regulations (as costs and benefits are defined in Circular A-4),⁸ and the effects on industry costs as well as any changes to environmental and health outcomes. This project includes two main products: the first is the forthcoming catalog, which inventories existing federal regulations promulgated after 2005 and other federal activities of concern to industry (e.g., permitting) relevant to the development and transportation of oil and gas resources. The second product is a report series that present our analyses of the cost savings and forgone benefits associated with the repeal or

³ Executive Office of the President. 2017. Executive Order 13783: Promoting Energy Independence and Economic Growth. *Federal Register* 82(61): 16093, March 28. <https://www.federalregister.gov/documents/2017/03/31/2017-06576/promoting-energy-independence-and-economic-growth>.

⁴ Executive Office of the President. 2017. Executive Order 13771: Reducing Regulation and Controlling Regulatory Costs. *Federal Register* 82(22): 9339, February 3. <https://www.federalregister.gov/documents/2017/02/03/2017-02451/reducing-regulation-and-controlling-regulatory-costs>.

⁵ Office of Management and Budget. 2017. Guidance Implementing Executive Order 13771, Titled “Reducing Regulation and Controlling Regulatory Costs.” April 5. <https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/memoranda/2017/M-17-21-OMB.pdf>.

⁶ “Presidential Executive Order on Reducing Regulation and Controlling Regulatory Costs,” <https://www.whitehouse.gov/the-press-office/2017/01/30/presidential-executive-order-reducing-regulation-and-controlling>.

⁷ We will discuss this catalog in a forthcoming summary document.

⁸ Office of Management and Budget. 2003. Circular A-4, Regulatory Analysis. *Federal Register* 68: 58366, October 9. <https://www.federalregister.gov/documents/2003/10/09/03-25606/circular-a-4-regulatory-analysis>.

modification of six major regulations affecting the oil and gas sector (these are outlined in the executive summary).⁹ The six rules were chosen to cover a wide range of types of rules and are not meant to suggest relative importance or that any are most targeted by the Trump administration. They illustrate the technical challenges and opportunities presented in performing cost-benefit analyses to support the repeal or modification of the rules. This report covers the PHMSA gas distribution pipeline rule.¹⁰

A forthcoming summary document will include cross-cutting analyses to compare the results of these six analyses—in particular, ranking the results by net benefits (preferred by economists) and also cost savings, the metric emphasized by OMB’s guidance related to EO 13711.

3. Methods

The objective of each cost-benefit analysis was to calculate the cost savings and forgone benefits associated with repeal (also referred to as elimination) and modification of the rule or, in certain cases, delay of the rule. To meet this objective, we carefully read each proposed and final rule and its associated regulatory impact analysis (RIA), as well as

any technical support documentation available for the rule. We also noted stakeholder comments and concerns as addressed in the *Federal Register* notice for the final rule (the agency’s formal response to commenters) as well as any text in the final rule addressing comments. In addition, we searched for any parallel industry analyses and subsequent industry comments gathered as part of the Trump administration’s regulatory reform initiative. Table 2 defines key terminology that will be used in this report and across the series.

We took the following steps to conduct our analyses, for this report on PHMSA’s gas distribution pipeline rule and across the report series: Each discussion of a rule begins with background on the purpose of the rule, its history, and its current status (e.g., whether it has been repealed or is slated for repeal or modification). Next, we summarize the rule with details to provide context about the consequences of repeal or modification of all or some of its parts. We then replicated the cost-benefit analysis presented in the final RIA by creating a series of spreadsheets of extracted data and other information. We were able to replicate the analyses with only very minor differences.

⁹ As defined by EO 12866, a “significant regulatory action” means any regulatory action that is likely to result in a rule that may: (1) Have an annual effect on the economy of \$100 million or more”, among other criteria.

¹⁰ 74 FR 63906, “Pipeline Safety: Integrity Management Program for Gas Distribution Pipelines,” <https://www.gpo.gov/fdsys/pkg/FR-2009-12-04/pdf/E9-28467.pdf>.

TABLE 2. DEFINITIONS OF KEY TERMINOLOGY

Term	Definition
Cost Savings or Avoided Costs	The amount saved by eliminating or modifying the rule (i.e., the opposite of the costs of implementing a rule).
Benefits Forgone	Benefits that would not be realized by eliminating or modifying the rule (i.e., the opposite of the benefits of implementing a rule).
Net Benefits of Repeal or Elimination	The cost savings of a rule minus the benefits forgone with a positive result, meaning eliminating the rule has a positive net welfare effect on society. Net benefits can be negative, in which case they could be termed net costs to society.
Replication	Re-created original RIA and changed nomenclature to put into rule elimination terms: defining costs as cost savings, benefits as benefits forgone, and net benefits (costs) as net benefits (costs) of elimination.
Corrections	Changes to underlying assumptions to bring the replication up to date and make it comparable across different rules
Baseline	The result of corrections to the replication. All subsequent scenarios are compared to the baseline.
Costs Adjustment Scenarios	Sensitivity analyses using changes to underlying cost parameters/assumptions in the original RIA.
Benefits Adjustment Scenarios	Sensitivity analyses using changes to underlying benefit parameters/assumptions in the original RIA.
Rule Modification	Changes to the requirements of rule itself (i.e., sources covered, frequency of surveying, as opposed to changes in parameters/assumptions used in the RIA).

3.1. Corrections to Generate a Baseline

In order to ensure that the cost savings, forgone benefits, and net benefits of elimination reflect the most accurate, currently available information, we changed some of the underlying assumptions of the RIA (and refer to these changes as corrections). We also made corrections where we could to address compliance issues for calculating the costs and benefits of repealing a regulation. These issues are explained below.

First, we updated data where possible, mainly based on the US Energy Information Administration's (EIA's) oil and gas price estimates released in the *Annual Energy Outlook* each year. Second, if an RIA originally subtracted cost savings from costs, we added cost savings to the benefits side of the equation (and made corresponding adjustments to the RIA cost estimates) so that our analyses remain consistent within recent

guidance from the OMB for EO 13771. Third, we also made some further accounting corrections for comparability across rules, including start and end year analyzed (and, implicitly, the period analyzed). As regulations often have an indefinite lifetime, the endpoint for an analysis can be arbitrary. In comparing rules, those with longer periods analyzed will have greater net present values of both benefits and costs, other things equal. PHMSA's gas distribution pipeline rule uses a 50-year period of analysis, whereas BLM's methane rule uses a 10-year period of analysis and EPA's methane rule looks only at impacts in the years 2020 and 2025. To address this issue, in our forthcoming summary report, we will compare the net present values of costs, benefits, and net benefits over 10 years.

Once we have updated and corrected the baseline, we create our "repeal baseline," which we use to assess the cost savings and benefits forgone associated with repealing a

regulation. We subtract the benefits forgone (i.e., a cost of repealing a rule) from the costs avoided (i.e., the benefit of repealing a rule) to calculate the net benefits of repeal. The first equation below illustrates the benefits of keeping the rule (termed “baseline”).

Scenarios that modify the rule are compared against the baseline for keeping the rule rather than against the repeal baseline, as we do not believe the administration would modify the rule only to later repeal it. The second equation below describes the calculation of the net benefits of repeal, which we use to calculate the repeal baseline. Both baselines include the corrections outlined above.

BASELINE

$$\text{Net benefits (of keeping or modifying the rule)} \\ = \text{Benefits} - \text{Costs}$$

REPEAL BASELINE

$$\text{Net benefits (of repeal)} = \text{Costs avoided} - \\ \text{Benefits forgone}$$

The regulated entities may have already begun to comply with the regulation after its passage, until its repeal or until a plan to repeal or modify the rule is publicized. Capital expenditures spent to comply with a regulation are sunk costs, so they should not be counted as cost savings if a regulation is eliminated. Future operating costs, however, would count as costs saved if a regulation is eliminated. To the extent that compliance has already occurred, cost savings and forgone benefits would be lower. When the RIA provided a clear schedule for compliance, as in this case, an adjustment was made, though that is not always the case.

RIAs often account for overlapping or duplicative state regulations, for instance, by not counting costs and benefits from compliance in states with existing regulations.

In between the time the regulation is finalized and eliminated, however, additional states may pass overlapping or duplicative regulation. Thus, if the federal regulation is eliminated, the states’ regulations will still be in force and there will be less or no associated cost savings from repeal in those states, depending on the stringency of those regulations. One could also argue that states’ proposed regulations should also be taken into account.¹¹

3.2. Cost Adjustment Scenarios

Working from the repeal baseline, we build scenarios that change the underlying assumptions of the RIA to assess any changes to the costs of the rule if the compliance costs of certain provisions were more or less expensive.

First, we searched the RIA for alternative cost assumptions. Second, we searched the rule’s docket for comments that provided enough information for us to use an alternative cost assumption. If we found compelling evidence in either source, we recalculated cost savings, benefits forgone, and net benefits of repeal accounting for this input. The comments we used were submitted by stakeholders, including the American Petroleum Institute (API), Independent Petroleum Association of America (IPAA), Western Energy Alliance, Sierra Club, Environmental Defense Fund (EDF), Pew Charitable Trusts, and others. We also searched for comments submitted to agencies in the spring of 2017, when they requested public input on the Trump administration’s regulatory reform efforts.

3.3. Benefits Adjustment Scenarios

In addition to cost adjustments, we made adjustments to the benefits, using the same

¹¹ It may be a step too far to assume that some states will be incentivized to pass legislation offsetting the effect of eliminating a federal regulation.

process described above and also making what we considered reasonable changes to various assumptions, such as using alternative estimates for the social cost of carbon (SCC) or a range of potential risk reduction levels.

Benefits measurements were often subject to large uncertainties, so for several rules we conducted break-even analyses, a method often employed in RIAs. Break-even analysis in the context of repealing a rule calculates what the uncertain parameter would have to be to equate forgone benefits to cost savings. If decisionmakers think the real value of this parameter is likely to be larger than the break-even parameter estimate, then repeal would not be warranted (in terms of economic efficiency). Symmetrically, if they think the parameter is lower, it may be economically efficient to repeal the rule. Of course, in the face of large uncertainty, a risk averse regulator may choose not to repeal a regulation when it is unclear whether the parameter is lower or higher than the break-even estimate.

Under guidance from the Trump administration, agencies are increasingly questioning the valuation of ancillary benefits (co-benefits) of various rules. These refer to benefits that come along with efforts aimed at addressing another pollutant or activity, such as the climate benefits of reducing mercury pollution. Agencies sometimes forgo the valuation of ancillary benefits, particularly when benefits exceed costs by a wide margin. Agencies may choose to do so because they find it difficult or impossible to quantify, and doing so in cases of large uncertainty may complicate interpretation of the results.

The Trump administration critiqued the inclusion of ancillary benefits in RIAs, arguing that they mask the “true net costs” of rulemakings (EPA 2017a). When looking at the forgone benefits of repeal, however, ignoring forgone ancillary benefits is not justifiable because they still would have

accrued to society regardless of whether these benefits were the target of a regulation. Counting these ancillary benefits ensures that an analysis accurately describes the true net costs of a rulemaking (Krupnick and Keyes 2017). Nevertheless, in this project we were not able to account for ancillary benefits if they were missing from the original RIA.

3.4. Rule Modification Scenarios

There are innumerable ways any given rule can be modified, including changes to the sources covered or frequency of monitoring and reporting. We limited the possibilities for modification to what was quantifiable based on agency estimates for alternative requirements, quantitative estimates provided by industry or other stakeholder comments, and our judgment about what would make for an enlightening modification. Coming from industry, the requested modifications would generally lower costs of the rule but may also lower the benefits. Symmetrically, the requested modifications coming from environmental groups would generally increase the benefits of the rule but may also increase the costs. Because the modifications are highly rule-specific, we address them in detail in our analysis of each rule’s RIA.

3.5. Discussion and Conclusions

After presenting the multiple cost-benefit analyses for repeal and modification of each rule, we then provide a qualitative discussion of aspects of repealing or modifying a rule that we could not quantify. These were often driven by comments that criticize some aspect of a rule but provide no basis for empirical analysis of how the costs and benefits would change if the rule were altered to address the comment. We also tracked the agency’s response to comments and non-monetized effects of the rules (often indirect or distributional), such as on jobs or commodity prices.

We conclude each report by summarizing the rule-specific analyses and generalizing

about whether certain types of modifications or repeal make sense from an economic efficiency (net benefit) perspective. We do not compare our results across rules in each individual report. A forthcoming summary report will include cross-cutting analyses and comparisons.

4. Background: Pipeline Safety: Integrity Management Program for Gas Distribution Pipelines

4.1. Purpose

The gas distribution rule aims to prevent natural gas leaks and incidents from occurring on distribution pipelines by requiring operators to inspect and repair weaknesses in their system proactively. This process is broadly known as integrity management planning.

Integrity management planning requirements were previously put in place for hazardous liquid pipelines (in 2000) and for gas transmission pipelines (in 2003).¹² In response to recommendations from the Department of Transportation’s inspector general and the National Transportation Safety Board, as well as to comply with the Pipeline Inspection, Protection, Enforcement and Safety (PIPES) Act of 2006, PHMSA published this rule in 2009, extending integrity management planning to gas distribution pipelines, the largest part of the pipeline infrastructure in the United States.

Distribution pipelines serve homes, schools, businesses, and other end users directly and are inherently different from hazardous liquid and gas transmission pipelines, thus necessitating a separate

rulemaking. For example, distribution pipelines tend to be thinner and operate at a lower pressure than transmission pipelines, suggesting that distribution line inspection and repair planning may need to be different (AGA 2018).

4.2. Regulatory History and Current Status

The gas distribution pipeline rule, finalized in 2009, is currently in effect and has not been targeted specifically by the Trump administration for repeal or modification; however, given its status as an “economically significant” rulemaking, it is listed in the Department of Transportation’s Notice of Regulatory Review as a rule that may be particularly burdensome to industry.¹³ We reviewed major stakeholder comments (AGA, API, and INGAA 2017; APGA 2017; EDF 2017; Southern Company Gas 2017; IPAA 2017; AFPM 2017) on the proposed rule seeking input on which rules to target for review, and none of them stated that this rule should be repealed. However, given the large costs associated with this rule (and thus the potential for large cost savings if it is repealed) and its direct impact on the oil and gas industry, we chose to analyze it in this series. In addition, because the rule was promulgated nearly a decade ago, it allows us to do interesting retrospective analysis, including updating important inputs, calculating benefits that could not previously have been quantified, and exploring the rule’s impact in reducing accidents.

4.3. Rule Summary

Integrity management planning, as described in the RIA, requires operators “to

¹² 65 FR 75378, “Pipeline Safety: Pipeline Integrity Management in High Consequence Areas (Hazardous Liquid Operators With 500 or More Miles of Pipeline,” <https://www.gpo.gov/fdsys/pkg/FR-2000-12-01/pdf/00-29570.pdf>; 68 FR 69778, “Pipeline Safety: Pipeline Integrity Management in High Consequence Areas (Gas Transmission Pipelines),” <https://www.gpo.gov/fdsys/pkg/FR-2003-12-15/pdf/03-30280.pdf>.

¹³ 82 FR 45750, <https://www.gpo.gov/fdsys/pkg/FR-2017-10-02/pdf/2017-21101.pdf>.

continually assess, evaluate, repair and validate through comprehensive analysis the integrity of pipeline segments, and to take actions to address applicable threats and integrity concerns” (PHMSA 2009). Operators must submit annual reports on leak inspections and repairs to federal and state authorities. Small operators and liquefied petroleum gas (LPG) operators have slightly simpler and less stringent requirements, with greater assistance in developing plans available from the agency. Plans must have been in place by August 2, 2011. This rule applies only to the existing distribution pipeline network—not to new pipelines.

In addition, as mandated by the PIPES Act of 2006, operators are required to install excess flow valves (EFVs), which automatically shut off the flow of gas if the pressure reaches a certain threshold (thereby reducing the risk of leaks or accidents), on new and replaced residential service lines serving single residences. Previously, operators were required to notify customers of the availability of EFVs for installation and of the costs and benefits of the EFV; if a customer requested an EFV, only then was the operator required to install it. This rule replaced the notification requirement.

Based on PHMSA’s assumptions in the RIA of existing pipeline mileage and services, we calculated that about 5 percent of the distribution pipeline network will be inspected

every year because of this rule. In addition, over the 50-year period of analysis in the RIA, we calculated that one-third of 1 percent of the existing mains and services will be replaced as a result of this rule. In spite of this tiny percentage, costs of the rule are large by any measure.

5. Results

In this section, we describe the adjustments made to the original RIA in order to generate a baseline, as well as scenarios that change cost and benefit inputs to the RIA and modify the rule. Following PHMSA’s methodology, these results will be presented as a net present value over a 50-year time period in 2008\$. The discussion will focus on estimates using a 3 percent discount rate. Tables summarizing estimates for a 7 percent discount rate can be found in Appendix A.

5.1. Replication

We were able to replicate PHMSA’s estimates within 5 percent, with the exception of our replication of the net present value of low net benefits, which was off substantially, by over 40 percent (see Table 3). While we acknowledge this inconsistency, we are not significantly concerned about it.¹⁴ We found costs to be \$2.7 billion, with \$2.9 billion and \$4.4 billion in benefits for what the RIA says are low and high benefits cases, respectively.¹⁵ This yields a low net benefits estimate of \$159 million and a high net benefits estimate of \$1.6 billion over 50 years.

¹⁴ The 40 percent estimate equals [(Replication benefits – costs) – (Original RIA benefits – costs)]/(Original RIA benefits – costs). The numerator is driven by a small difference in costs, which is then divided by a small original net benefit estimate. Thus, our actual replication error in an absolute sense is small.

¹⁵ For the remainder of this report, we shorten this phrase to “low and high benefits.”

TABLE 3. GENERATING A BASELINE, NET PRESENT VALUE AT 3% DISCOUNT RATE (MILLION 2008\$)

KEEPING RULE					
	Costs	Benefits (Low)	Benefits (High)	Net Benefits (Low)	Net Benefits (High)
Original RIA	2,783	2,942	4,373	159	1,590
Replication	2,718	2,941	4,358	223	1,639
<i>% difference*</i>	-2%	0%	0%	40%	3%
Corrections for Dollar Year and Miscalculation	2,718	3,060	4,484	342	1,766
<i>% difference**</i>	0%	4%	3%	53%	8%
Time Period Correction	2,690	2,941	4,358	252	1,668
<i>% difference**</i>	-1%	0%	0%	13%	2%
Updating Natural Gas Price	2,690	1,702	3,126	(988)	437
<i>% difference**</i>	-1%	-42%	-28%	-542%	-73%
Updating Reduced Lost Gas	2,690	3,189	4,613	499	1,924
<i>% difference**</i>	-1%	8%	6%	124%	17%
Updating VSL Guidance	2,690	3,238	4,999	548	2,310
<i>% difference**</i>	-1%	10%	15%	146%	41%
Baseline	2,690	1,926	3,687	(764)	997
<i>% difference**</i>	-1%	-35%	-15%	-442%	-39%

*Percentage difference from original.

**Percentage difference from replication

The costs of this rule are related to the development, implementation, and management of an integrity management plan, as well as mitigation of leaks (replacing leaking mains and services found as a result of integrity management). There are many different categories of benefits of this rule:

- avoided deaths, injuries, and property damage from reduced accidents
- revenues to industry from captured natural gas that would otherwise have leaked along the distribution network
- avoided emergency response
- avoided evacuations
- costs saved from ending the EFV notification requirement

The rule calculates low and high estimates of benefits, based on the expectation for how effective the rule will be. The low estimate assumes a 20 percent reduction in incidents, while the high estimate assumes a 50 percent reduction in incidents.

5.2. Corrections to Generate a Baseline

We made a number of corrections to the RIA in this rule, described in detail below. Small changes in the estimates of costs and benefits result from updates to the dollar year and miscalculations in the original RIA. We also shift the 50-year time period to 2018, meaning estimates are for the next 50 years of the rule's implementation, rather than 50 years from the promulgation of the rule. Corrections resulting in significant changes to the estimates of costs and benefits are the updates to the natural gas price, emissions reductions, and the estimate of the value of statistical life (VSL).

Corrections for Dollar Year and Miscalculation. In the original RIA, a number of inputs were used that did not align with the dollar year convention of the RIA. The RIA states that all estimates are in 2008\$, but the inputs used to calculate some benefits were not. These inputs include the savings from avoided fire department calls (due to reduced incidents), the VSL, avoided

property damages from reportable excavation incidents, and the natural gas price.

In addition, the RIA has a clear miscalculation of the benefits of reduced evacuations from non-reportable excavation incidents. In the original RIA, PHMSA did not multiply the low estimate of benefits by the total pipeline mileage, despite the value of reduced evacuations of this type being given in dollars per million miles per year.

These corrections do not affect costs, but the low and high benefits increase slightly to \$3 billion and \$4.5 billion.

Time Period Correction. For the baseline we shift the time period of analysis to 2018, as the costs and benefits of this rule are annual and recurring in perpetuity. Therefore, the net present value of costs and benefits are for implementation for the next 50 years, rather than 50 years after the promulgation of the rule in 2009. According to the timetable estimated by PHMSA, \$840 billion (undiscounted) in costs accrued between 2010 and 2017, while between \$888 million and \$1.3 billion (both undiscounted) in benefits were realized. We estimate that based on the reduction in incidents between 2010 and 2016, and including only the corrections for dollar year, the benefits realized were within this range: between \$1 billion and \$1.1 billion (undiscounted). Over the next 50 years, we expect the rule to generate net benefits between \$252 million and \$1.7 billion, slightly higher than the replication. Note that the remaining corrections also reflect this time period adjustment.

Updating Natural Gas Price. One category of benefits under this rule is revenues to the operator from the sale of natural gas saved from the prevention of natural gas leaks. In the original RIA, PHMSA used the 2005 US Natural Gas Citygate Price, which was \$8.67 per thousand cubic feet (mcf).¹⁶ We updated this

value to the 2016 price, which was \$3.71 per mcf in nominal dollars (\$3.31 per mcf in 2008\$) (EIA 2017). This lowers the benefits substantially: the low benefits estimate decreases 42 percent to \$1.7 billion, while the high benefits estimate decreases 28 percent to \$3.1 billion. Notably, this update makes the low estimate of net benefits negative, suggesting that if the rule is 20 percent effective, there are net costs to society of implementing the rule.

Updating Reduced Lost Gas. PHMSA based its calculation of the benefits from the sale of captured gas on methane emissions from the gas distribution system as estimated in EPA's Greenhouse Gas Inventory. (This rule differs from others in our series that include revenues from the sale of lost gas in that it backs into the amount of natural gas based on methane emissions, rather than estimating based on the reduction in natural gas leaking.) In the original RIA, the figure is based on the 2005 value, which is 1,303 gigagrams (Gg). PHMSA estimates that natural gas is 80 percent methane by weight, so the amount of natural gas lost is about 85 billion cubic feet. PHMSA assumes that 10 percent of this lost gas will be captured and sold as a result of the rule. In our baseline, we update the figure to its 2009 amount, which is 1,383 Gg (EPA 2011). We chose the amount from 2009 because it is the last full year prior to mitigation actions occurring as a result of this rule; in other words, we believe that using the 2009 figure is the best counterfactual to what methane emissions, and thus reduced lost gas, would be without the rule. Choosing a more recent year would underestimate the emissions reductions attributable to this rule, as recent data likely reflect reductions in emissions as a result of compliance with this rule. This update increases the net present value of low and high benefits to \$3.2 billion and \$4.6 billion, respectively. Net benefits are positive using both the low and high benefits cases.

¹⁶ Citygate is defined as "a point or measuring station at which a distributing gas utility receives gas from a natural gas pipeline company or transmission system" (EIA 2018a).

Updating Value of Statistical Life Guidance. The original RIA used the Department of Transportation's (DOT's) 2008 guidance on the VSL and value of reduced injuries. In 2008, DOT estimated the VSL at \$5.8 million (in 2007\$). DOT updated this guidance most recently in 2016; the update supported using a VSL of \$9.6 million (in 2016\$) (DOT 2016). We use the updated VSL guidance (converted to 2008\$, this is \$8.6 million) to calculate benefits from reduced fatalities. In addition, PHMSA estimated the value of avoided hospitalized injuries at \$562,000 (in 2008\$) per injury, approximately 10 percent of the VSL. We applied this same percentage to the updated VSL for an updated estimate of avoided hospitalized injuries of \$831,000 (in 2008\$). This update increases benefits by 10 to 15 percent, to \$3.2 billion (low) and \$5 billion (high).

Combining all these corrections generates a baseline of \$2.7 billion in costs (relatively similar to the replication) and \$1.9 billion and \$3.7 billion in the low and high benefits cases, respectively, which are substantially lower than the replication.

There are net costs to society of \$764 million of implementing the rule based on the low benefits estimate, but there are net benefits to society of \$997 million based on the high benefits estimate.

Using the formula in Section 3.1, we also develop a repeal baseline. As discussed in Section 4.3, this rule contains a deregulatory provision: it removed the existing EFV notification requirement and replaced it with a requirement that EFVs must be installed on new or replaced distribution pipes serving single family residences. The savings from removing the notification requirements are included as a benefit of the implementation of this rule. However, were this rule to be repealed, we would not expect the Trump administration to reinstate the notification requirement. Therefore, we remove it from the benefits forgone calculation in Table 4. According to the repeal baseline, we estimate that there would be net benefits to society of \$789 million using the low benefits forgone estimate and net costs to society of \$972 million using the high benefits forgone estimate from repealing this rule.

TABLE 4. GENERATING A BASELINE FOR REPEAL, NET PRESENT VALUE AT 3% DISCOUNT RATE (MILLION 2008\$)

REPEALING RULE					
	Costs Avoided	Benefits Forgone (Low)	Benefits Forgone (High)	Net Benefits of Repeal (Low)	Net Benefits of Repeal (High)
Using Original RIA Figures	2,783	2,942	4,373	(159)	(1,590)
Replication	2,718	2,941	4,358	(223)	(1,639)
<i>% difference*</i>	-2%	0%	0%	-40%	-3%
Corrections for Dollar Year and Miscalculation	2,718	3,035	4,459	(317)	(1,741)
<i>% difference**</i>	0%	3%	2%	-42%	-6%
Time Period Correction	2,690	3,035	4,459	(346)	(1,770)
<i>% difference**</i>	-1%	3%	2%	-55%	-8%
Updating Natural Gas Price	2,690	1,677	3,101	1,012	(412)
<i>% difference**</i>	-1%	-43%	-29%	553%	75%
Updating Reduced Lost Gas	2,690	3,164	4,588	(475)	(1,899)
<i>% difference**</i>	-1%	8%	5%	-112%	-16%
Updating VSL Guidance	2,690	3,213	4,974	(524)	(2,285)
<i>% difference**</i>	-1%	9%	14%	-134%	-39%
Repeal Baseline	2,690	1,901	3,662	789	(972)
<i>% difference**</i>	-1%	-35%	-16%	453%	41%

*Percentage difference from original.

**Percentage difference from replication

5.3. Cost Adjustment Scenarios

We developed only one cost adjustment scenario for this rule, shown in Table 5. Because of the lengthy time period of analysis of this rule, we thought it appropriate to account for growth in the labor rate. In the original analysis, the fully loaded cost of labor was fixed for large and small operators at \$70 per hour and for master meter operators at \$50 per hour. In our adjustment, we assume a 1.18

percent growth in real wages each year for the next 50 years, which is based on recent DOT guidance on the VSL and used in the other PHMSA rule in our series, the Hazardous Materials: Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains rule (PHMSA 2015).¹⁷ This adjustment increases the costs avoided by 14 percent to \$3 billion, compared with the baseline value of \$2.7 billion.

TABLE 5. RESULTS OF COST ADJUSTMENTS, NET PRESENT VALUE AT 3% DISCOUNT RATE (MILLION 2008\$)

REPEALING RULE					
	Costs Avoided	Benefits Forgone (Low)	Benefits Forgone (High)	Net Benefits of Repeal (Low)	Net Benefits of Repeal (High)
Repeal Baseline	2,690	1,901	3,662	789	(972)
Accounting for Labor Rate Growth	3,055	1,901	3,662	1,155	(607)
% difference*	14%	0%	0%	46%	38%

*Percentage difference from baseline.

¹⁷ In the RIA for the tank car rule, PHMSA writes, “Based on real wage growth forecasts from the CBO, DOT’s guidance estimates that there will be an expected 1.18 percent annual growth rate in median real wages over the next 30 years (2013–2043)” (PHMSA 2015).

5.4. Benefits Adjustment Scenarios

We made many benefits adjustments for this rule to examine the sensitivity of the costs and benefits to those changes, primarily related to emissions and natural gas inputs. We include a scenario valuing the methane

emissions reductions resulting from this rule (which was not accounted for in the original analysis) as well as examine the effectiveness of the rule in reducing incidents and adjust valuation of future benefits based on experience with the rule. A summary of these results is shown in Table 6.

TABLE 6. RESULTS OF BENEFITS ADJUSTMENTS, NET PRESENT VALUE AT 3% DISCOUNT RATE (MILLION 2008\$)

REPEALING RULE					
	Costs Avoided	Benefits Forgone (Low)	Benefits Forgone (High)	Net Benefits of Repeal (Low)	Net Benefits of Repeal (High)
Repeal Baseline	2,690	1,901	3,662	789	(972)
Lower Reduced Lost Gas	2,690	1,363	3,124	1,326	(435)
<i>% difference*</i>	0%	-28%	-15%	68%	55%
Valuing Emissions Reductions (Domestic)	2,690	2,390	4,152	299	(1,462)
<i>% difference*</i>	0%	26%	13%	-62%	-50%
Valuing Emissions Reductions (Global)	2,690	6,522	8,283	(3,832)	(5,594)
<i>% difference*</i>	0%	243%	126%	-586%	-475%
High Consequence Accident Damages	2,690	1,901	3,719	789	(1,030)
<i>% difference*</i>	0%	0%	2%	0%	-6%
Varying Natural Gas Price Over Time	2,690	2,597	4,358	93	(1,668)
<i>% difference*</i>	0%	37%	19%	-88%	-72%
Experience with the Rule	2,690	2,253	2,424	436	265
<i>% difference*</i>	0%	19%	-34%	-45%	127%
Combined 1	3,055	3,439	3,610	(384)	(555)
<i>% difference*</i>	14%	81%	-1%	-149%	43%
Combined 2	3,055	7,571	7,741	(4,515)	(4,686)
<i>% difference*</i>	14%	298%	111%	-672%	-382%

*Percentage difference from baseline.

Lower Reduced Lost Gas. As discussed in Section 5.2, the estimate of reduced lost gas relies on the methane emissions reductions figure used in the RIA. In the original RIA, PHMSA used the 2005 Greenhouse Gas Inventory figure estimating distribution system emissions at 1,303 Gg. In our baseline, we update the Greenhouse Gas Inventory figure to the 2009 estimate, which is 1,383 Gg. Though we believe this change more accurately estimates the amount of gas captured as a result of this rule, we wanted to explore the impact on forgone benefits of repealing this rule under a scenario in which reduced lost gas is lower than expected. We use the 2015 Greenhouse Gas Inventory estimate of distribution emissions, which is 439 Gg, to make a lower (more conservative) reduced lost gas scenario (EPA 2017b). This adjustment decreases the low estimate of benefits forgone to \$1.3 billion (a 28 percent decrease) and the high estimate of benefits forgone to \$3.1 billion (a 15 percent decrease).

Valuing Emissions Reductions. Though this rule results in methane emissions reductions, PHMSA did not quantify the value of these emissions reductions in the original RIA, likely because the development and promulgation of this rule preceded the use of a government-wide metric known as the social cost of carbon (SCC). Because there is now a government precedent for quantifying the benefits of methane emissions reductions using the social cost of methane (SC-CH₄), we include two scenarios that value the methane emissions reductions attributable to this rule.

There is ongoing controversy over what the proper value is for the SCC and SC-CH₄. One of the primary debates over valuing greenhouse gas emissions reductions is whether to use a domestic value, which accounts for benefits accruing only to the United States, or a global value, which accounts for benefits accruing domestically and internationally. Rulemakings under the

Obama administration used the global value, while the Trump administration has argued in favor of using the domestic value. A more detailed presentation of the arguments on both sides of this issue can be found in Appendix B.

PHMSA estimates a 10 percent reduction in lost gas from the natural gas distribution system as a result of this rule. Using the same proportion to calculate methane emissions reductions as a result of this rule, we estimate that the rule results in reductions of 14 Gg, or 152,000 short tons, annually. (For comparison, 152,000 short tons is about half the emissions reductions expected to result in 2020 under EPA's Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources New Source Performance Standards, another [rule analyzed](#) in this series)

We include two scenarios valuing these methane emissions reductions using the SC-CH₄, both of which substantially increase the benefits forgone of repealing this rule. The first scenario uses the domestic SC-CH₄ as presented in the RIA for repeal of another rule in this analysis, BLM's Waste Prevention, Production Subject to Royalties, and Resource Conservation rule, which is \$121 per short ton (in 2008\$ and at a 3 percent discount rate) (BLM 2017). In this case, the low estimate of benefits increases to \$2.4 billion, and the high estimate of benefits forgone increases to \$4.2 billion. Notably, there are still net benefits of repeal under this scenario using the low benefits estimate, yet there are still net costs of repeal using the high benefits estimate.

The second scenario uses the global SC-CH₄ as used in the BLM and EPA methane rules, which is \$1,144 per short ton (in 2008\$ and at a 3 percent discount rate) (EPA 2016). In this case, the low estimate of benefits forgone increases to \$6.5 billion, and the high estimate of benefits forgone increases to \$8.3 billion. There are net costs to society of repeal using both the low and high estimates of benefits.

Updated Natural Gas Consumption for High-Consequence Event Damage Probability. As previously stated, many of the benefits of this rule come from a reduction in incidents due to natural gas leaks. The primary types of incidents quantified in this rule are minor incidents (either excavation-related or non-excavation-related) that may or may not result in deaths or hospitalizations but overall are estimated to result in fewer than 10 deaths and 20 hospitalizations annually. The annual number of incidents avoided, as well as avoided deaths, hospitalizations, and property damages, is based on US incident data from 2001 to 2008. In addition, PHMSA wanted to account for benefits from the reduction in the probability of major, high-consequence accidents that could result in 45 deaths and 90 hospitalizations per event. There have not been any accidents of this severity in the United States recently, so PHMSA had to find another way to estimate the number of these accidents.

To calculate the number of avoided high-consequence accidents, PHMSA converts EIA's estimate of natural gas consumption in the United States into the electrical energy equivalent to multiply by the probability of a high-consequence accident—0.0001 accidents per gigawatt electrical (GWe) per year—from a study of international data from the Paul Scherrer Institut (PSI 2005). PHMSA used the 2006 gas consumption figure in the original RIA and estimated that over 50 years, 1.2 high-consequence accidents would be avoided by this rule. We update the gas consumption figure to the 2016 value (EIA 2018b), which is about 25 percent higher than the 2006 value, to see what would happen to forgone benefits with greater natural gas consumption. In this scenario, 1.5 high-consequence accidents would be avoided by this rule. The high estimate of benefits forgone increases just 2 percent with this adjustment, remaining around \$3.7 billion as in the repeal baseline.

Varying Natural Gas Price. The original RIA used one price of natural gas to calculate revenues from the sale of captured gas as a result of this rule, meaning that the sale of this gas generates the same revenues every year for the entire 50 year period of analysis. In this scenario, we allow the natural gas price to vary over time, which we think provides a more accurate representation of the revenue stream over PHMSA's chosen time period. As stated in Section 5.2, PHMSA used EIA's citygate price to determine industry revenues from captured gas. EIA does not make projections for this particular value, so to estimate the price for the next 50 years, we use figures from the Annual Energy Outlook (AEO) 2017 (EIA 2017), applying the percentage change in the industrial natural gas price (\$3.71 per thousand cubic feet in 2016) to develop an estimate through the last year projected in the AEO, 2050, at which point we hold the 2050 value (\$6.98 per thousand cubic feet) constant through 2067. Under this adjustment, the benefits forgone increase substantially: the low benefits forgone estimate increases 37 percent to \$2.6 billion, and the high benefits forgone estimate increases 19 percent to \$4.4 billion. There are still net benefits to society of repeal using the low benefits forgone estimate and net costs to society of repeal using the high benefits forgone estimate.

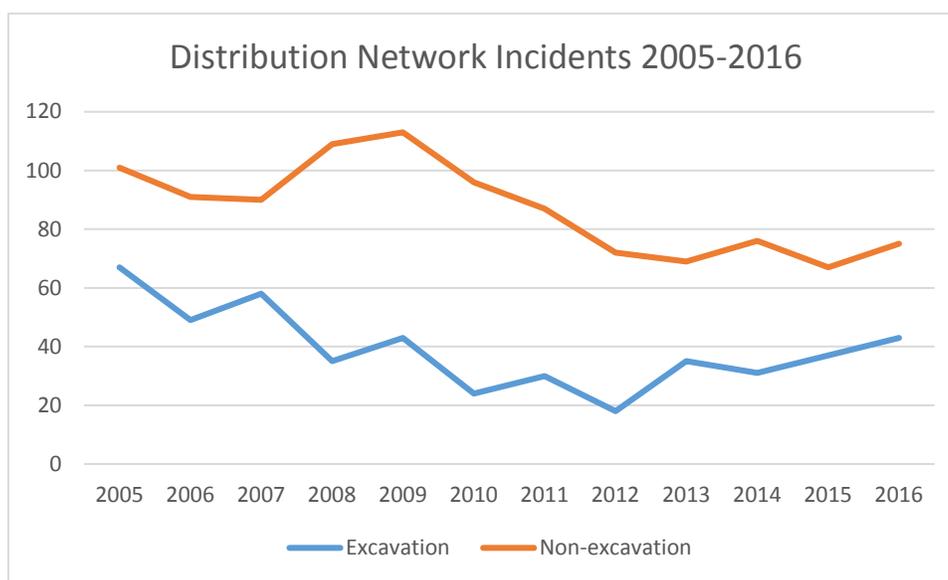
Adjusting for Experience with the Rule. This rule is the only one in our series of six rules that was promulgated prior to 2010, meaning we have ample and reliable data about what the impact of the rule has been. We therefore sought to adjust the assumption on the effectiveness of the rule as it pertains to benefits (and benefits forgone from repeal) to reflect the realized impact of the rule. In other words, because we have six years of data on incidents in which inspection and mitigation has been taking place, we can adjust the expected outcome of the rule accordingly to

more accurately reflect its impact based on these years of experience with the rule.

There are two types of minor incidents prevented by this rule: excavation, of which fewer are predicted to occur and therefore result in fewer deaths and hospitalizations annually, and non-excavation incidents, of which more are predicted to occur and therefore result in more deaths and

hospitalizations annually. Figure 1 compares excavation with non-excavation incident occurrences between 2005 and 2016, based on data from PHMSA. Non-excavation incidents have seen a steady decline even before the implementation of the rule, while excavation incidents have declined somewhat as well. Both types of incidents experienced an uptick recently between 2015 and 2016.

FIGURE 1. EXCAVATION VERSUS NON-EXCAVATION INCIDENTS ON DISTRIBUTION PIPELINES, 2005–2016



Source: PHMSA Pipeline Incident Database. <https://www.phmsa.dot.gov/data-and-statistics/pipeline/pipeline-incident-20-year-trends>.

To find the effectiveness of the rule in preventing each type of incident, we sum the number of incidents that occurred between 2010 and 2016 and divide by the number of incidents projected to occur without the rule from the original RIA, then subtract that proportion from 1. We find that non-excavation incidents have decreased by 11 percent over this time period and that excavation incidents have decreased by 49 percent. As a simplification, we assume that the rule itself is responsible for these incident reductions. We then apply these percentages to the calculation of benefits of reduced incidents to their respective types (non-excavation and excavation) to get an estimate of the impact of repealing the rule based on the rule's effectiveness in reducing each type of incident. Notably, this is the only scenario that results in net benefits to society of repealing the rule under both the low and high estimates of net benefits of repeal, which are between \$265 million and \$436 million.

In other reports in this series, we have used break-even analysis extensively. In this report, we believe the only break-even point of interest is that of the estimated effectiveness of the rule in reducing incidents. As previously described, PHMSA estimated the rule would reduce between 20 and 50 percent of incidents occurring on gas distribution pipelines, and we estimate that the rule has reduced between 11 and 49 percent of incidents, based on the type of incident (excavation or non-excavation) and on the assumption that all observed reductions are due to the rule. We find that for our baseline estimate, the rule must prevent at least 31 percent of total incidents in order for the rule's costs to equal its benefits.

We also combine the cost adjustment and multiple benefits adjustment scenarios in Table 6. Both combined scenarios include the labor rate growth adjustment, the natural gas price forecast, and experience with the rule

benefits adjustment, as well as a valuation of methane emissions reductions. The first combined scenario uses the domestic SC-CH₄, while the second combined scenario uses the global SC-CH₄. Both combined scenarios yield net costs of repeal. This suggests that in accounting for developments over the last several years, including the valuation of methane emissions reductions and experience with the rule, as well as varying key inputs over a long period of time (as they will vary over such a long time period), the rule is highly likely to be net beneficial to society.

5.5. Rule Modification Scenarios

Through our examination of comments on this rule, we found no quantifiable rule modifications that could be incorporated into our analysis, but we include a qualitative discussion of comments in Section 6.1.

6. Discussion

6.1. Public Comments

In general, stakeholders seem to be supportive of this rule. It has not been a source of great controversy, likely because the regulation uses a flexible, performance-oriented approach, rather than a more prescriptive approach. It has not been a specific target of scrutiny by the Trump administration.

Some commenters requested changes to reporting frequency and documentation requirements for certain actions, as they found the proposed or final regulation to be too burdensome in this regard (AGA 2008; AGA 2010; Southwest Gas 2008). In comments on the proposed rule, the American Gas Association (AGA) requested that PHMSA allow alternative, risk-based inspection intervals given the differing situations of operators (AGA 2008). In comments on the final rule, the AGA sought a delay of reporting requirements to allow more time for the operator to make changes and repairs based on final rather than draft reports (AGA 2010).

The National Propane Gas Association requested in response to the proposed rule that LPG operators be exempt entirely from the rule, as there are relatively few incidents in these types of systems, and existing regulations already target LPG operators sufficiently in this area (NPGA 2008). PHMSA did not incorporate this suggestion into the final rule.

6.2. Non-Monetized or Indirect Impacts

PHMSA acknowledges in the RIA that it does not quantify potential increased public confidence following the implementation of this rule, nor does it estimate cost savings to industry from reduced surveillance for replaced pipeline, rapid response to severe leaks that would be mitigated by this rule, or the reduction in the large number of leaks that need to be monitored but not necessarily excavated and repaired (PHMSA 2009). PHMSA also does not estimate employment impacts or impacts on natural gas production based on this rule.

7. Conclusion

Using our repeal baseline, we find that if the rule prevents only 20 percent of possible incidents (the low benefits forgone estimate), there are net benefits to society of repeal; however, if the rule prevents 50 percent of possible incidents (the high benefits forgone estimate), there are net costs to society of repeal.

Using a longer time period of analysis (50 years, as PHMSA chose when making the RIA for this rule) requires exploring how certain inputs are likely to change into the far future, such as the labor rate and natural gas price, which we have done here. We find that allowing these two inputs to vary does significantly affect the value of net benefits of repeal as compared with the repeal baseline, though ultimately it does not change our qualitative conclusion about repealing the rule.

Though this rule has not been a significant source of controversy (neither at its promulgation nor now, nearly ten years later, under the Trump regulatory review), it presents many interesting methodological questions about benefit-cost analysis, such as retrospective valuation of climate benefits not originally included as a benefit of the rule and comparing expected outcomes with realized outcomes and adjusting the valuation as such.

Using a domestic social cost of methane yields the same qualitative conclusion about repeal as our baseline; however, using a global social cost of methane would yield net costs of repeal using both the low and high effectiveness rates.

Based on incident data between 2010 and 2016, the rule appears to be more effective in preventing excavation incidents (which are down 49 percent) than non-excavation incidents (which are down 11 percent). Accounting for this experience with the rule indicates that repealing the rule would yield net benefits to society; however, combining this adjustment with the valuation of methane emissions reductions, as well as varying other key inputs, yields net costs to society of repeal under both a global *and* a domestic social cost of methane.

This rule has shown to be a useful exercise in retrospective analysis of regulation and demonstrates a case in which going back to review regulations can significantly change the conclusions made about the cost-effectiveness of the rule.

References

- AFPM (American Fuel & Petrochemical Manufacturers). 2017. “Comments of the American Fuel & Petrochemical Manufacturers on the Department of Transportation’s Regulatory Review, ‘Notification of Regulatory Review’ Docket No. DOT-OST-2017-0069 82 Fed. Reg. 45750 (October 2, 2017).” <https://www.regulations.gov/document?D=DOT-OST-2017-0069-2785>.
- AGA (American Gas Association). 2008. “Comments of the American Gas Association on the Proposed Rule for Natural Gas Distribution Integrity Management.” <https://www.regulations.gov/document?D=PHMSA-RSPA-2004-19854-0097>.
- . 2010. “Comments of the American Gas Association on Integrity Management Program for Gas Distribution Pipelines.” <https://www.regulations.gov/document?D=PHMSA-RSPA-2004-19854-0275>.
- . 2017. “Notification of Regulatory Review Docket No. OST-2017-0069 Comments of the American Public Gas Association.” <https://www.regulations.gov/document?D=DOT-OST-2017-0069-2252>.
- . 2018. “How Does the Natural Gas Delivery System Work?” <https://www.aga.org/natural-gas/delivery/how-does-the-natural-gas-delivery-system-work/>.
- AGA, API, and INGAA (American Gas Association, American Petroleum Institute, and Interstate Natural Gas Association of America). 2017. “Notification of Regulatory Review Docket No. OST-2017-0069 Comments of the American Gas Association, the American Petroleum Institute, the Interstate Natural Gas Association of America.” <https://www.regulations.gov/document?D=DOT-OST-2017-0069-1504>.
- BLM (US Bureau of Land Management). 2017. “Regulatory Impact Analysis for the Proposed Rule to Suspend or Delay Certain Requirements of the 2016 Waste Prevention Rule.” <https://www.regulations.gov/document?D=BLM-2017-0002-0002>.
- CEA (Council of Economic Advisers). 2017. “Discounting for Public Policy: Theory and Recent Evidence on the Merits of Updating the Discount Rate.” https://obamawhitehouse.archives.gov/sites/default/files/page/files/201701_cea_discounting_issue_brief.pdf.
- Cropper, Maureen, Robert Kopp, Richard Newell, William A. Pizer, Kevin Rennert, Casey Wichman. 2017. “Comments on ‘Waste Prevention, Production Subject to Royalties, and Resource Conservation; Delay and Suspension of Certain Requirements.’” <https://www.regulations.gov/document?D=BLM-2017-0002-17257>.
- DOT (US Department of Transportation). 2016. “Guidance on Treatment of the Economic Value of Statistical Life (VSL) in U.S. Department of Transportation Analyses—2016 Adjustment.” <https://cms.dot.gov/sites/dot.gov/files/docs/2016%20Revised%20Value%20of%20a%20Statistical%20Life%20Guidance.pdf>.
- EDF (Environmental Defense Fund). 2017. “Comments of Environmental Defense Fund (EDF) on the Department of Transportation’s (DOT) Notification of Regulatory Review.” <https://www.regulations.gov/document?D=DOT-OST-2017-0069-2739>.
- EIA (US Energy Information Administration). 2017. “Annual Energy Outlook 2017.” <https://www.eia.gov/outlooks/archive/aeo17/>.

- . 2018a. “Natural Gas: Definitions, Sources and Explanatory Notes.” https://www.eia.gov/dnav/ng/TblDefs/ng_pri_sum_tbldef2.asp.
- . 2018b. “U.S. Natural Gas Total Consumption.” <https://www.eia.gov/dnav/ng/hist/n9140us2a.htm>.
- EPA (US Environmental Protection Agency). 2011. “Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2009.” https://www.epa.gov/sites/production/files/2015-12/documents/us-ghg-inventory-2011-complete_report.pdf.
- . 2016. “Regulatory Impact Analysis of the Final Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources.” <https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100P4QE.TXT>.
- . 2017a. “EPA Takes Another Step to Advance President Trump’s America First Strategy, Proposes Repeal of ‘Clean Power Plan.’” News release. <https://www.epa.gov/newsreleases/epa-takes-another-step-advance-president-trumps-america-first-strategy-proposes-repeal>.
- . 2017b. “Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2015.” https://www.epa.gov/sites/production/files/2017-02/documents/2017_complete_report.pdf.
- Fraas, Art, Randall Lutter, Susan Dudley, Ted Gayer, John Graham, Jason F. Shogren, and W. Kip Viscusi, 2016. “Social Cost of Carbon: Domestic Duty.” *Science* 351 (6273): 569.
- Howard, Peter, and Jason Schwartz. 2017. “Think Global: International Reciprocity as Justification for a Global Social Cost of Carbon.” *Columbia Journal of Environmental Law* 42: 203–94.
- IPAA (Independent Petroleum Association of America). 2017. “RE: Docket No. DOT-OST-2017-0069, Notification of Regulatory Review.” <https://www.regulations.gov/document?D=DOT-OST-2017-0069-2781>.
- Krupnick, Alan J., and Amelia Keyes. 2017. “Hazy Treatment of Health Benefits: The Case of the Clean Power Plan.” *Common Resources* (blog). <http://www.rff.org/blog/2017/hazy-treatment-health-benefits-case-clean-power-plan>.
- Linn, Joshua, and Alan J. Krupnick. 2017. “Ninety-Six Regulatory Experts Express Concerns about Trump Administration Reforms.” *Common Resources* (blog). <http://www.rff.org/blog/2017/ninety-six-regulatory-experts-express-concerns-about-trump-administration-reforms>.
- Moore, Frances C., Uris Baldos, Thomas Hertel, and Delavane Diaz. 2017. “New Science of Climate Change Impacts on Agriculture Implies Higher Social Cost of Carbon.” *Nature Communications* 8 (1): 1607. <https://doi.org/10.1038/s41467-017-01792-x>.
- NPGA (National Propane Gas Association). 2008. “Re: Pipeline Safety: Integrity Management Program for Gas Distribution Pipelines {Docket No. PHMSA-RSPA-2004-19854}.” <https://www.regulations.gov/document?D=PHMSA-RSPA-2004-19854-0197>.
- OMB (US Office of Management and Budget). 2003. Circular A-4. https://obamawhitehouse.archives.gov/omb/circulars_a004_a-4/.
- . 2017. “Guidance Implementing Executive Order 13771, Titled ‘Reducing Regulation and Controlling Regulatory Costs.’” <https://www.whitehouse.gov/sites/whiteho>

[use.gov/files/omb/memoranda/2017/M-17-21-OMB.pdf](https://www.regulations.gov/files/omb/memoranda/2017/M-17-21-OMB.pdf).

- PHMSA (US Pipeline and Hazardous Materials Safety Administration). 2009. “Regulatory Impact Analysis: Final Rule; Pipeline Safety: Integrity Management Program for Gas Distribution Pipelines.” <https://www.regulations.gov/document?D=PHMSA-RSPA-2004-19854-0255>.
- . 2015. “Final Regulatory Impact Analysis of Hazardous Materials: Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains.” Office of Hazardous Material Safety. <https://www.regulations.gov/document?D=PHMSA-2017-0102-0016>.
- PHMSA. Pipeline Data and Statistics: Pipeline Incidents Database. Accessed March 13, 2018. <https://www.phmsa.dot.gov/data-and-statistics/pipeline/pipeline-incident-20-year-trends>.
- PSI (Paul Scherrer Institut). 2005. “Comparative Assessment of Natural Gas Accident Risks.” https://www.psi.ch/ta/PublicationTab/Burgherr_2005.pdf.
- Southern Company Gas. 2017. “Comments of Southern Company Gas on the Notification of Regulatory Review.” <https://www.regulations.gov/document?D=DOT-OST-2017-0069-2732>.
- Southwest Gas. 2008. “Comments on Pipeline Safety: Integrity Management Program for Gas Distribution Pipelines.” <https://www.regulations.gov/document?D=PHMSA-RSPA-2004-19854-0106>.

Appendix A: Seven Percent Discount Rate Results

TABLE A-1. GENERATING A BASELINE, NET PRESENT VALUE AT 7% DISCOUNT RATE (MILLION 2008\$)

KEEPING RULE					
	Costs	Benefits (Low)	Benefits (High)	Net Benefits (Low)	Net Benefits (High)
Original RIA	1,618	1,639	2,437	21	819***
Replication	1,527	1,639	2,428	112	901
<i>% difference*</i>	-6%	0%	0%	432%	10%
Corrections for Dollar Year and Miscalculation	1,527	1,705	2,499	178	971
<i>% difference**</i>	0%	4%	3%	59%	8%
Time Period Correction	1,499	1,639	2,428	140	929
<i>% difference**</i>	-2%	0%	0%	26%	3%
Updating Natural Gas Price	1,499	948	1,742	(550)	243
<i>% difference**</i>	-2%	-42%	-28%	-592%	-73%
Updating Reduced Lost Gas	1,499	1,777	2,570	278	1,072
<i>% difference**</i>	-2%	8%	6%	149%	19%
Updating VSL Guidance	1,499	1,804	2,786	306	1,287
<i>% difference**</i>	-2%	10%	15%	173%	43%
Baseline	1,499	1,073	2,054	(426)	556
<i>% difference**</i>	-2%	-35%	-15%	-481%	-38%

*Percentage difference from original.

**Percentage difference from replication.

***We believe PHMSA made an arithmetic error in Table 17 in the original RIA. It stated that the high net benefits of the rule discounted at 7% are \$719 million, although the calculation is based on the equation \$2.437 billion – \$1.618 billion, which equals \$819 million.

TABLE A-2. GENERATING A BASELINE FOR REPEAL, NET PRESENT VALUE AT 7% DISCOUNT RATE (MILLION 2008\$)

REPEALING RULE					
	Costs Avoided	Benefits Forgone (Low)	Benefits Forgone (High)	Net Benefits of Repeal (Low)	Net Benefits of Repeal (High)
Using Original RIA Figures	1,618	1,639	2,437	(21)	(819)
Replication	1,527	1,639	2,428	(112)	(901)
<i>% difference*</i>	-6%	0%	0%	-432%	-10%
Corrections for Dollar Year and Miscalculation	1,527	1,691	2,485	(164)	(958)
<i>% difference**</i>	0%	3%	2%	-47%	-6%
Time Period Correction	1,499	1,691	2,485	(193)	(986)
<i>% difference**</i>	-2%	3%	2%	-72%	-9%
Updating Natural Gas Price	1,499	934	1,728	564	(229)
<i>% difference**</i>	-2%	-43%	-29%	605%	75%
Updating Reduced Lost Gas	1,499	1,763	2,557	(264)	(1,058)
<i>% difference**</i>	-2%	8%	5%	-137%	-17%
Updating VSL Guidance	1,499	1,790	2,772	(292)	(1,273)
<i>% difference**</i>	-2%	9%	14%	-161%	-41%
Repeal Baseline	1,499	1,059	2,040	440	(542)
<i>% difference**</i>	-2%	-35%	-16%	493%	40%

*Percentage difference from original.

**Percentage difference from replication.

TABLE A-3. RESULTS OF COST ADJUSTMENTS, NET PRESENT VALUE AT 7% DISCOUNT RATE (MILLION 2008\$)

REPEALING RULE					
	Costs Avoided	Benefits Forgone (Low)	Benefits Forgone (High)	Net Benefits of Repeal (Low)	Net Benefits of Repeal (High)
Repeal Baseline	1,499	1,059	2,040	440	(542)
Accounting for Labor Rate Growth	1,649	1,059	2,040	590	(391)
<i>% difference*</i>	10%	0%	0%	34%	28%

*Percentage difference from baseline.

TABLE A-4. RESULTS OF BENEFITS ADJUSTMENTS, NET PRESENT VALUE AT 7% DISCOUNT RATE (MILLION 2008\$)

REPEALING RULE					
	Costs Avoided	Benefits Forgone (Low)	Benefits Forgone (High)	Net Benefits of Repeal (Low)	Net Benefits of Repeal (High)
Repeal Baseline	1,499	1,059	2,040	440	(542)
Lower Reduced Lost Gas	1,499	760	1,741	739	(242)
<i>% difference*</i>	0%	-28%	-15%	68%	55%
Valuing Emissions Reductions (Domestic)	1,499	1,332	2,313	167	(815)
<i>% difference*</i>	0%	26%	13%	-62%	-50%
Valuing Emissions Reductions (Global)	1,499	3,634	4,615	(2,135)	(3,117)
<i>% difference*</i>	0%	243%	126%	-586%	-475%
High-Consequence Accident Damages	1,499	1,059	2,072	440	(574)
<i>% difference*</i>	0%	0%	2%	0%	-6%
Varying Natural Gas Price over Time	1,499	1,413	2,395	85	(896)
<i>% difference*</i>	0%	33%	17%	-81%	-65%
Experience with the Rule	1,499	1,256	1,351	243	148
<i>% difference*</i>	0%	19%	-34%	-45%	127%
Combined 1	1,649	1,883	1,978	(233)	(328)
<i>% difference*</i>	10%	78%	-3%	-153%	39%
Combined 2	1,649	4,185	4,280	(2,535)	(2,631)
<i>% difference*</i>	10%	295%	110%	-677%	-386%

*Percentage difference from baseline.

Appendix B: Issues in Using a Domestic or Global Social Cost of Methane (SC-CH₄) and CO₂ (SCC)

Economists, policymakers, and others have been debating the appropriate metric for counting the benefits from reducing greenhouse gas emissions. These debates surround whether the global or domestic social costs of greenhouse gas reductions should be used in RIAs accompanying regulations, as well as how large those costs might be given uncertainties in measuring both global and domestic social costs. Whether one uses a global or domestic social cost is highly consequential, as most of the damages from global warming will fall on more vulnerable, poorer nations. Some models even show the United States benefiting, at least partly, from global warming, particularly in agriculture.

The argument for a domestic SCC and SC-CH₄ is that the use of global estimates may conflict with long-standing federal regulatory policy: Circular A-4 directs agencies to “focus on benefits and costs that accrue to citizens and residents of the United States. Where you choose to evaluate a regulation that is likely to have effects beyond the borders of the United States, these effects should be reported separately” (OMB 2003, 15). Based on this policy, Fraas et al. argue that “a decision to issue a regulation with substantial domestic costs based on a finding that benefits to foreigners ‘justify’ such costs would be irregular at best” (2016, 569).

The main argument for using a global SCC and SC-CH₄ is that greenhouse gases are global pollutants—damages occur in the United States and abroad, and furthermore,

some impacts occurring abroad can affect the United States through the global economy (Cropper et al. 2017). Cropper et al. (2017) note that using a domestic SCC would ignore 86 percent of the costs. Further, as Cropper et al. state, while the choice to use a domestic figure “is consistent with a narrow application of prior regulatory analysis practice under OMB’s Circular A-4, it is unnecessarily and unreasonably constrained for addressing inherently global pollutants such as greenhouse gases” (2017, 4). (There are other reasons for and against using domestic SCC and SC-CH₄ figures. Readers are encouraged to consult the congressional testimony of Ted Gayer¹⁸ for arguments in favor of a domestic social cost, and Howard and Schwartz (2017)¹⁹ for arguments in favor of a global social cost.)

A practical middle ground is to calculate the benefits of regulations using each measure, without indicating a preference or weight, so that decisionmakers can see a range of potential impacts.

But even if all agree that a domestic SCC and SC-CH₄ should be used in an RIA, there is still a question about what domestic value should be used (indeed, the same question can be asked of the global estimates; see below). In particular, several RFF researchers have taken issue with the Trump administration’s interim domestic estimates specifically because of the methodology used to calculate those figures (Cropper et al. 2017). The Trump administration’s interim figure makes use of a 7 percent discount rate, which many economists find to be inappropriate for use in the SCC or SC-CH₄. Cropper et al. outline the issues with using a 7 percent discount rate in their comments to BLM:

¹⁸ *At What Cost? Examining the Social Cost of Carbon: Joint Hearing before the Subcomm. on Environment & Subcomm. on Oversight, Comm. on Science, Space, and Technology, 115th Cong. 1* (2017) (statement of Ted Gayer, Vice President and Director of Economic Studies and Joseph A. Pechman Senior Fellow at Brookings Institution), <https://www.gpo.gov/fdsys/pkg/CHRG-115hrg24670/pdf/CHRG-115hrg24670.pdf> 24–33.

¹⁹ Howard, Peter, and Jason Schwartz. 2017. “Think Global: International Reciprocity as Justification for a Global Social Cost of Carbon.” *Columbia Journal of Environmental Law* 42: 203-294.

Though the addition of an estimate calculated using a 7 percent discount rate is consistent with past regulatory guidance under OMB Circular A-4, it is inappropriate for use in estimating the SC-CH₄ through BLM's methodology. The integrated assessment models used to generate the estimates report their output in terms of "consumption-equivalent" impacts, which is intended to reflect the effective impact on people's consumption (as opposed to investment). Standard economic practice is to discount consumption equivalents at the "consumption rate of interest," which according to OMB's current guidance is a 3 percent discount rate. It is therefore inappropriate to use such modeling results with OMB's 7 percent discount rate, which is intended to represent the historical before-tax return on private capital. None of the researchers whose model results were used to generate the interim values employs a discount rate as high as 7 percent in their work (2017, 5).

Cropper et al. (2017) also point to a recent Council of Economic Advisers study that suggests using a 2 percent consumption rate of interest at most, given historical trends (CEA 2017).

For the reasons outlined above, the Trump administration's domestic estimate is likely to underestimate impacts to the United States from greenhouse gas emissions. Furthermore, both the global and domestic social costs are likely underestimates, as the models used to calculate both values rely on older research, particularly with respect to agricultural damages (Moore et al. 2017). For now, presenting both the global and interim domestic figures together, but using a 3 percent rather than a 7 percent discount rate, as suggested by Cropper et al. (2017), provides the most informative results.