Safety of Gas Transmission Pipeline Rule

Cost Analysis

A Review of the Natural Gas
Notice of Proposed Rulemaking (NPRM) and
Preliminary Regulatory Impact Analysis (PRIA)

Interstate Natural Gas Association of America
(INGAA)

July 7, 2016

Study Disclaimer

The objective of the Cost Analysis is to report the high-level impact on transmission pipelines operators from the proposed natural gas pipeline safety regulations issued by Pipeline and Hazardous Materials Safety Administration (PHMSA) on April 8, 2016. Since the rule has yet to be reviewed and finalized, Process Performance Improvement Consultants, LLC (P-PIC) assumes the impact of the rule as if promulgated in its current version. The impact from the proposed rule on gathering pipelines is not part of this report.

P-PIC has no intention or authority to advise INGAA or individual operators about compliance strategies or regulatory interpretations. P-PIC's analysis provides an overview of potential impacts and costs. Any additional evaluation of the data might lead to incorrect interpretations and application of results.

The results of the analysis were derived from a subset of operators representing more than three quarters of the natural gas transmission pipeline mileage in the U.S. and from a set of assumptions based on operator input, vendor costs, including percent factors of current compliance rates, repair methods, post-weather assessments types and labor hours. Changes in ILI technology can dramatically impact repair rates based on increased tool sensitivities. The study also assumes that transmission pipeline operators can accommodate the increased resources needed to comply with the proposed regulation. The analysis addresses some of these issues, but does not capture all future outcomes. To better understand the full impact of the regulation, both in terms of cost and benefits, additional assessments may be warranted once the final regulation is promulgated.

An additional caveat, if the final rule mandates more prescriptive regulation than outlined in the NPRM –the cost models in this analysis will require re-evaluation. Conversely, if the final rule includes alternatives that might be discussed during the upcoming Gas Pipeline Safety Advisory Committee (GPAC) meeting, allowing for longer implementation periods or flexibility in certain areas, then costs will change. In general, given how the current NPRM is written, the rule appears to have the greatest impact on MAOP verification, MCA assessments, Management of Change (MOC) and repair criteria outside HCAs. The magnitude of cost is dependent on the sensitivities incorporated into the final rule.

P-PIC's analysis was based on assumptions provided in the NPRM. Finalization of the regulation has the potential to introduce additional cost elements. Furthermore, due to the enormity of the proposed regulatory changes and inconsistencies with existing rules, any final regulation could differ from what is modeled in this analysis.

Table of Contents

A. RIA Background

The federal government creates or modifies rules and regulations through a rulemaking process guided by the Administrative Procedure Act (APA), codified in title 5, United States Code. The process involves notice in the Federal Register and the opportunity for public comment in a docket maintained by the regulating agency.

Identifying a regulatory action is typically the result of a public petition, internal review, investigation or an act of Congress. The rulemaking team creates a work plan, summarizing and defining the rulemaking project in a draft Notice of Proposed Rulemaking (NPRM). The NPRM must clear the Office of Management and Budget (OMB) and deemed a significant or economically significant rule, which requires a published Regulatory Impact Analysis (PRIA) that provides detailed cost and benefit analysis of the rule.

The PRIA was commissioned by PHMSA and conducted by the Cycla Group, an economics firm. The RIA attempts to satisfy the requirements of the Executive Orders (EO) 12866, EO 13272 and EO 13563, that have been issued to ensure new regulations do not pose undue burdens. The executive orders mandate federal agencies to demonstrate that the societal benefits of their proposed regulations outweigh – and thus justify – the additional costs imposed on the affected industry(ies). EO 12866 requires regulatory review by Office of Management and Budget (OMB) if the annual costs of the regulations exceed $100 million. EO 13272 requires agencies to consider whether their new rules would disproportionately affect small operators and, if so, to conduct a Regulatory Flexibility Analysis (RFA), which would seek alternative methods that would achieve the same regulatory goals while presenting lower costs for the smaller operators.

PHMSA published its PRIA in March 2016. PHMSA issued the NPRM to address congressional mandates from 2011 and subsequent recommendations from National Transportation Safety Board (NTSB) and General Accounting Office (GAO). The PRIA asserts that the proposed rules were justified due to the societal benefits that would outweigh the annual costs to industry, which it estimated would be approximately $47.4 million with a 3 percent discount. The annual benefits were estimated to be between $270-310.8 million at a 3 percent discount. Because the annual costs were estimated to be below the $100 million threshold and to not disproportionately affect small operators, no further regulatory review was conducted.

For the Gas Transmission and Gathering NPRM, PHMSA granted an initial 60-day public comment period, then extended for an additional 30 days and closing on July 7, 2016. The summary below is a review of the PRIA and critiques the major assumptions and costs supported in the PRIA.

1.0 Topic Area 1: Reconfirming MAOP, Verify Material Properties and Integrity Assessment outside HCAs

1.1 NPRM Overview

MAOP Validation: 192.624, 192.607 and 192.619(e)
Based on the NPRM, MAOP confirmation would be required for:

- Previously untested pipe including grandfathered pipe using pressure tests or inline inspection (ILI) in conjunction with engineering critical assessments (ECA).
    - Operates at greater than 30% SYMS in a HCA
    - Operate at pressures less than or equal to 30% SYMS in a HCA
    - Operate at pressures greater than or equal to 20% SYMS located in a Class 3 or 4 location or in a piggable[1] pipeline located in a newly defined MCA Class 1 or Class 2 location
- Pipelines lacking adequate documentation, such as missing or unavailable documentation.
- Pipelines where an in-service incident since its last hydrostatic test was the result of a manufacturing or construction-related, crack-related threat.

Non-HCA Assessments: 192.710

- Data analysis requirements for assessments conducted similar to HCA
- Assessment methods similar to HCA
- Repair requirements and schedules for non-HCA anomalies and conditions discovered as a result of the assessment required by 192.710 or 192.624
    - Immediate conditions
    - Two year conditions

1.2 Estimated Affected Gas Transmission Mileage

P-PIC worked with the same numbers of affected miles as were used in the PRIA and which were sourced from the *2014 PHMSA Annual Report* data. PHMSA calculated mileage for each topic area based on certain assumptions, such as the estimated percent of MCA mileage assumed to be piggable. For the purposes of analyzing this topic area, P-PIC considered PHMSA's mileage calculations to be an accurate representation of industry transmission mileage with the addition of reportable in-service incident since last pressure test (PT) data. **Table 1** reflects mileage outlined in the PRIA in Topic Area 1, plus the additional mileage estimate.

Table 1: Onshore Mileage Reported in RIA

Location	Untested HCA> 30%	Inadequate Records	Untested HCA Operating at	Untested Class 3,	MCA Mileage	Reportable In-Service Incident

[1] For this document the term piggable segment means the same as an instrumented inline inspection segment

	SMYS Mileage[1]	Mileage[2]	20-30% SYMS[3]	Class 4 HCA[3]	Class 1 and Class 2[3]	since last Pressure Test
Interstate						
Class 1	59	79	3	0	630	354[4]
Class 2	19	97	2	0	538	
Class 3	357	1,109	41	888	0	
Class 4	0	1	0	0	0	
Intrastate						
Class 1	10	32	1	0	78	114[4]
Class 2	13	34	4	0	147	
Class 3	451	2,886	213	724	0	
Class 4	3	126	3	1	0	
Total	912	4,364	267	1,613	1,393	468

Source: PHMSA 2014 Annual Report data

1. RIA Table 3-2 page 34

2. RIA Table 3-26 page 49 Includes HCA and non-HCA (Class 3 and 4).

3. RIA Table 3-40

4. Based on incident rate from 2010-2015 for pipe incidents extrapolating the rate back to 1970. Assumes one-mile length per pipeline segment. Assumes that these segments are primarily Class 1 and Class 2 locations. PHMSA does not include this mileage or cost estimate.

According to operator input, the majority of MCA pipeline mileage subject to Topic Area 1 is actually an aggregation of short pipeline segments that are a 1 mile or shorter in length. This is because the pipelines intermittently travel through short lengths of previously unregulated areas in between longer stretches of regulated areas. As a result, for more accurate results, P-PIC is basing cost estimates on a per-foot basis, rather than on a per-mile basis. **Table 3** converts pipeline mileage applicable to Topic Area 1 into feet.

Table 2: Onshore Mileage Reported in RIA by Feet

Location	HCA>30% SMYS in Feet	Inadequate Records in Feet	Untested HCA Operating at 20-30% SYMS	Untested Class 3, Class 4 HCA	MCA Mileage Class 1 and Class 2	Reportable In-Service Incident since last subpart J pressure test
Interstate						
Class 1	311,520	417,120	15840	-	3326400	18,712,320
Class 2	100,320	512,160	10560	-	2840640	
Class 3	1,884,960	5,855,520	216480	4688640	-	
Class 4	0	5,280	0	-	-	
Intrastate						
Class 1	52,800	168,960	5280	-	411840	6,040,320
Class 2	68,640	179,520	21120	-	776160	
Class 3	2,381,280	15,238,080	1124640	3822720		
Class 4	15,840	665,280	15840	5280		

Source: PHMSA 2014 Annual Report data. Reportable in-service incident since last subpart J pressure test data was not included in the RIA. Mileage based on Table 2.

1.3 Available MAOP Validation Methods

The methods specified in the proposed rule include a spike pressure test if a pipeline includes legacy pipe, was constructed using legacy construction techniques, or if there has been a reportable in-service incident since the most recent successful pressure test due to an original manufacturing-related defect, a construction-, installation-, or fabrication-related defect, or a crack or crack-like defect. To verify the MAOP of modern pipe without the risk factors, operators would be allowed to conduct a normal pressure test or a series of ILIs in conjunction with an engineering critical assessment (ECA).

As explained in detail in the INGAA comments section on MAOP reconfirmation, as proposed, the methods for ILI and ECA in § 192.624 are not feasible.

One of the main reasons the PRIA underestimates compliance costs that would be incurred when implementing the requirements in this topic area is that the PRIA mistakenly assumed operators would overwhelmingly use ILIs, which are cheaper to conduct than pressure tests, to validate the MAOPs of untested pipelines. For its compliance cost analysis, P-PIC assumed industry would continue to rely on pressure testing as the standard method to validate MAOP in previously untested pipe as required in the proposed rule.

1.4 Unit Costs for Reconfirming MAOP

Operator data was used in developing the cost model approach for PT in this section. Operators shared historical PT data that would fall within the parameters of 192.624 and 192.617 to explain the variance of cost. As mentioned above, the majority of the pipeline segments subject to Topic Area, categorized in MCAs, are mostly short, approximately a 1000 feet or less in length, much shorter than a typical HCA PT run.

As a result, for more accurate results, industry is basing cost estimates on a per-foot basis, rather than on a per-mile basis. This is important because due to set costs related to any pressure test, the costs, pro-rated by distance, will necessarily be higher for tests conducted over shorter runs. For instance, even though the "mileage tested would be the same," the cost of conducting one pressure test on a one-mile stretch of pipe will be considerably lower than the cost of conducting four ¼ mile tests in difference locations.

1.5 Pressure Test Unit Cost

Based on over 200 operator pressure test data points, the average cost to perform a pressure test is between $102 and $163 per foot of interstate and intrastate pipe, respectively and $417 per foot for MCAs.

Operators anticipate that MCA pressure test mileage will be short in length, typically less than 1000 feet. The fixed cost for mobilization is the fundamental factor in the

higher average cost per foot compared to pressure test average cost for longer length runs.

Table 3 shows average pressure test costs for typical interstate and intrastate pressure tests, as well as MCA pressure tests.

Table 3: Average Pressure Test Unit Costs

Component	Average Interstate PT Per Project Cost	Average Intrastate PT Per Project Cost	Average MCA PT Per Project Cost
Material	$233,873	$34,977	$46,991
Construction Contractor	$1,192,176	$205,880	$122,925
Company Cost	$136,240	$15,189	$29,968
Outside Services	$417,736	$43,896	$72,441
ROW Costs	$27,215	$7,445	$6,154
Environmental Costs	$12,059	$3,531	$1,453
Other	$23,667	$2,915	$2,270
Total	$2,042,964	$313,834	$282,201
Avg. Cost per Foot	**$102**	**$163**	**$417**

Source: Operator survey data

1.6 Annual Cost to Reconfirm MAOP, Previously Untested Pipe Operating at Greater than 30% SMYS in a HCA

From an industry perspective and based on the available methods to reconfirm MAOP in previously untested pipeline, industry derives costs in this section thru pressure test assessments only. Industry calculated the total compliance cost to reconfirm the MAOPs of these affected pipeline segments by multiplying the average unit cost for conducting the required pressure test by the estimated amount of affected footage.

Based on input from operators, reconfirming MAOP is a separate activity from integrity management. P-PIC does not subtract integrity management costs as a baseline in this section.

Table 4 shows incremental annual compliance costs for industry to re-establish MAOP on previously untested pipe operating at >30% SMYS in an HCA. Costs are divided and equally distributed over the compliance period (i.e., 1/15th each year for 15 years).

Table 4: Annual Compliance Cost

Location	Interstate	Intrastate
Class 1	$2,118,336	$573,760
Class 2	$682,176	$745,888
Class 3	$12,817,728	$25,876,576
Class 4	$0	$172,128
Total	**$15,618,240**	**$27,368,352**

Comparison of the RIA to Industry

The PRIA assumed MAOP validation could be achieved via less costly methods. As a result, it estimated the total annual industry compliance cost is substantial low. The PRIA also incorrectly assumed MAOP validation could be accomplished simultaneously during integrity management testing, so it subtracted baseline integrity management costs of approximately $1.6 million. This resulted in its net annual compliance cost estimate of $598,716.

Table 5 is a comparison between industry's and the PRIA's cost estimates for interstate and intrastate pipelines. PHMSA costs are based on Table 3-20 in the PRIA. Following this approach, the disparity between industry and the RIA is significant.

Table 5: Annual Compliance Cost

Location	Industry Interstate Costs	PHMSA Interstate Costs	Industry Intrastate Costs	PHMSA Intrastate Costs
Class 1	$2,118,336	$57,699	$573,760	$20,350
Class 2	$682,176	$19,783	$745,888	$40,291
Class 3	$12,817,728	$430,356	$25,876,576	$1,636,634
Class 4	$0	$102	$172,128	$9,837
Total	**$15,618,240**	**$507,940**	**$27,368,352**	**$1,707,112**
Baseline IM Costs	-	**-$428,511**	-	**-$1,187,826**
Total	**$15,618,240**	**$79,430**	**$27,368,352**	**$519,286**

1.7 Annual Cost to Reconfirm MAOP: Inadequate Records Located in HCAs and Class 3 and 4 Non-HCAs

P-PIC calculated the total compliance cost to reconfirm the MAOPs of pipeline segments with inadequate records located in HCAs and Class 3 and 4 non-HCAs by multiplying the average unit cost for conducting the required pressure test by the estimated amount of affected footage.

A 15-year compliance period was used to establish annual costs. **Table 6** shows incremental annual compliance costs for interstate and intrastate pipelines.

Table 6: Annual Total Compliance Cost

Location	Interstate	Intrastate
Class 1	$2,836,416	$1,836,032
Class 2	$3,482,688	$1,950,784
Class 3	$39,817,536	$165,587,136
Class 4	$35,904	$7,229,376
Total	**$46,172,544**	**$176,603,328**

Comparison of the RIA to Industry

The PRIA's estimates in this area suffer from the same incorrect assumptions as in the previous area. P-PIC used the annual cost totals outlined in the PRIA in Table 3-28, without subtracting the annual baseline assessment cost, for comparison purposes.

The difference in total cost between the industry's and the PRIA's cost estimates is shown above in Table 7.

Table 7: Annual Total Compliance Cost

Location	Industry Interstate Costs	PHMSA Interstate Costs	Industry Intrastate Costs	PHMSA Intrastate Costs
Class 1	$2,836,416	$81,418	$1,836,032	$64,885
Class 2	$3,482,688	$100,575	$1,950,784	$108,055
Class 3	$39,817,536	$1,865,734	$165,587,136	$11,546,239
Class 4	$35,904	$579	$7,229,376	$488,334
Total	**$46,172,544**	**$2,048,306**	**$176,603,328**	**$12,207,513**
Baseline IM Costs		**-$607,959**		**-$3,078,537**
Total	**$46,172,544**	**$1,440,347**	**$176,603,328**	**$9,128,976**

1.8 Estimation of Compliance Costs to Reconfirm MAOP for Previously Untested Pipe Other Than HCA Greater Than 30 Percent SMYS

The NPRM requires that all gas transmission pipelines constructed before 1970 be subject to spike hydrostatic pressure tests. The PRIA includes the following categories of pipe for this section:

- HCA operating at greater than 20 percent SMYS (>30% covered above)
- Non-HCA within Class 3 and Class 4 locations
- MCA within Class 1 and Class 2

Annual Costs for Other Untested Pipe

Based on mileage data from Table 2 the same PT unit costs were used to develop cost estimates for other untested pipe. The two different PT costs were applied based for the following categories:

- HCA operating at greater than 20 percent SMYS and Non-HCA within Class 3 and Class 4 locations
- MCA within Class 1 and Class 2

Estimation of MCA Pipe Replacement

Based on input from operators, MCA mileage includes many sections of short-length pipe. Industry estimates that 56% of pipe in this section is 1000 feet or less in length, and 20% of MCA pipe mileage is less than 200 feet in length and will be replaced as opposed to being pressure tested due to the relatively higher PT costs.

Unit costs for replacement were developed on a per foot basis. **Table 8** shows the annual costs at $349 million for industry to reconfirm MAOP in previously untested pipelines, other than pipe in HCA operating at >30% SMYS.

Table 8: Annual Costs to Reconfirm MAOP: Previously Untested Segments Other than HCA Operating at Greater than 30% SMYS

Location	Untested HCA Operating at 20-30% SYMS	Untested Class 3, Class 4 HCA	MCA Class 1 and Class 1/2—20% Mileage	MCA Mileage Class 1 and 2—Replaced-20%
Interstate				
Class 1	$107,712	-	$73,979,136	$44,352,000
Class 2	$71,808	-	$63,175,834	$37,875,200
Class 3	$1,472,064	$31,882,752	-	
Class 4	0	-	-	
Subtotal	**$1,651,584**	**$31,882,752**	**$137,154,970**	**$82,227,200**
Intrastate				
Class 1	$57,376	-	$9,159,322	$5,491,200
Class 2	$229,504	-	$17,261,798	$10,348,800
Class 3	$12,221,088	$41,540,224	-	
Class 4	$172,128	$57,376	-	
Subtotal	**$12,680,096**	**$41,597,600**	**$26,421,120**	**$15,840,000**
Total	**$14,331,680**	**$73,480,352**	**$163,576,090**	**$98,067,200**

Comparison of the RIA to Industry

Table 9 outlines the total compliance cost for complying with the regulation for reconfirming MAOP in untested areas other than greater than 30% SMYS.

Table 9: Annual Total Compliance Cost

Location	Industry Interstate Costs	PHMSA Interstate Costs	Industry Intrastate Costs	PHMSA Intrastate Costs
Class 1	$118,438,848	$184,740	$14,707,898	$24,952
Class 2	$101,122,842	$157,106	$27,840,102	$54,644
Class 3	$33,354,816	$1,487,390	$53,761,312	$2,608,335
Class 4	$0	$60	$229,504	$11,565
Total	**$252,916,506**	**$1,829,296**	**$96,538,816**	**$2,699,495**
Baseline IM Costs	-	**$45,779**	**-**	**$550,924**
Total	**$252,916,506**	**$1,783,517**	**$96,538,816**	**$2,148,571**

Source: Industry Survey Data and RIA Table 3-42 page 61

1.9 Estimation of Compliance Costs to Reconfirm MAOP for Reportable In-Service Incidents as defined in 191.3, since Most Recent Successful Subpart J Pressure Test

PHMSA proposes that any reportable in-service incident since its most recent successful subpart J pressure test, due to an original manufacturing-related defect, a construction, installation, or fabrication-related detect, or a cracking-related defect, including but not limited to seam cracking, girth weld cracking, selective seam weld corrosion, hard spot, or stress corrosion cracking and the pipeline segment located in one of the following locations would be required to reconfirm MAOP:

- A high consequence area as defined in 192.903;
- A class 3 or class 4 location; or
- A moderate consequence area as defined in 192.3 if the pipe segment can accommodate inspection by means of instrumented inline inspection tools (i.e. "smart pigs").

The RIA does not address reconfirming MAOP for this requirement.

Annual Compliance Costs

Based on mileage data from Table 2 and PT costs from Table 4, the following cost estimate was developed. **Table 10** shows the annual cost of compliance

Table 10: Annual Total Compliance Cost

Location	Cost
Interstate	$127,243,776
Intrastate	$65,638,144
Total	**$192,881,920**

1.10 Annual Cost to Inspect MCAs and Non-HCA Class 3 and 4

PHMSA is proposing to require integrity assessments of Class 1 and Class 2 MCAs and non-HCA Class 3 and Class 4 within 15 years, and every 20 years thereafter. PHMSA maintains that the majority of non-HCA and MCA mileage has been previously assessed in conjunction with a HCA assessment. PHMSA is allowing that prior assessments in non-HCA will suffice, if they meet subpart O requirements.

For compliance purposes, operators may use ILI, PT or DA and other methods in order to comply with the requirement. PHMSA used 2010-2014 Annual Report data to determine the percent factors of inspections. Based on their analysis, the majority of non-HCA Class 3 and Class 4 mileage for interstate and intrastate will comply using ILI or DA/other methods.

PHMSA estimated mileage by first examining the onshore gas transmission mileage and filtering based on Part Q non-HCA data and excluding inadequate MAOP records. Next, PHMSA determined the percent of MCAs that are part of non-HCA mileage. MCA percentages were applied to the total MCA Class 1 and Class 2 mileage based on Part R data from the Annual Report data. In addition, mileage was subtracted based on mileage subject to MAOP verification, which would count as an assessment. Based on these factors, PHMSA mileage estimates are low.

Costs for assessments utilize the total mileage of piggable MCA and other mileage subject to the requirement. A representative sample of more than 50,000 miles of gas transmission mileage was analyzed to determine the amount of HCA mileage, MCA mileage that included MCAs and Class 3 and Class 4 locations and MCA and Class 3 and 4 only locations. The mileage in MCA and Class 3 and 4 only locations was further analyzed to determine the percent of mileage that could be piggable. Based on those findings, industry determines the percent of non-HCA piggable rate by class. **Table 11** reflects the total mileage related to this requirement.

Table 11: MCA and Class 3 and 4 Mileage Estimates

Location	Non-HCA-Page 53 of RIA	Percent Non-HCA Piggable	Piggable Mileage
Interstate			
Class 1	159,374	71%	113,156
Class 2	16,774	70%	11,742
Class 3	7,378	60%	4,427
Class 4	10	56%	6
Subtotal	183,536		129,330
Intrastate			
Class 1	71,692	53%	37,997
Class 2	12,396	40%	4,958
Class 3	10,224	33%	3,374
Class 4	156	62%	97
Subtotal	94,468		46,426
Total	278,004		**175,756**

Source: Non-HCA data is on page 53 of the RIA. Piggable rates and mileage found on table 3-3 and 3-32

Estimation of MCA Identification

PHMSA concludes that because operators are assessing HCA boundaries the cost to identify MCAs is arbitrary.

Operators estimate that the annual cost includes a combination of components for both structures and roadways. For analysis purposes, industry used Table 3-32 of the RIA and determined that all non-HCA mileage would need to be evaluated to determine MCA boundaries.

1. Digitized and attributed structures – The annual update of these structures

and attributes is already being performed during HCA and class location analysis. Existing class and HCA calculators can be updated with MCA calculation. Each operator estimates that at a minimum it will cost $10,000 per operator.

2. Occupied Site and residential identification—This will be a manual effort to identify attributed and non-digitized structures. With the new MCA category operators estimate that it will take 3 hour for every one mile to assess.

3. Roadway centerline data—Operators will utilize data provided by PHMSA though the NPMS. All operators use the same file, no field or office verification required, PIR/centerline/roadway overlap is estimated to take operators roughly 1-5 days per operator depending on the depth of their GIS to complete. For cost purposes, industry estimates 8-hours of time to complete this activity.

4. Operator built roadway centerline file – Operators anticipate that it will take 2 hours per mile in class 3 and 4, and .5 hours in class 1 & 2 to get accurate data. This will include using the operator's aerial or satellite imagery and adjusting the four classifications of roadways within a buffer around the pipeline.

The cost components to maintain this data are outlined in **Table 12**.

Table 12: Annual Cost for MCA Identification

Component	Unit Cost	Mileage/Impacted Operators	Total Cost
Identifying and Digitizing Structures	$10,000 per Operator	942	$9,420,000
Occupied Site Identification and Residences with more than 5 people	3 Hour for every 1 miles for a engineer at $77.01	278,003[1]	$64,227,033
PHMSA Roadway Overlay	1-5 days per operator	942	$527,595
Operator built Roadway Centerline File	2 Hours per mile in Class 3 and 4 and .5 hours in class 1 and 2	278,003[1]	$12,757,015
Total Cost			**$86,931,643**

Source: RIA Table 3-32 of the RIA

1. Total Interstate and Intrastate non-HCA mileage

Estimation of MCA Annual Reporting and Recordkeeping

The unit cost of complying with the MCA reporting requirement will consist of: a) a one-time cost associated with developing new procedures; and b) the reoccurring costs of recordkeeping and annual reporting. Industry survey data was used to estimate the activities, labor hours and associated staff that would be involved.

Table 13 shows the applicable labor rates that are dedicated to supporting various reporting requirements. Labor rates were applied based on a breakdown of typical activities and types of occupations responsible for those functions and are based on the Bureau of Labor and Statistics (BLS) 2015 data. Operator labor costs are often higher due to the specialized nature of pipeline compliance, but BLS data was used in order to give a conservative estimate. **Table 14** provides the estimates of hours multiplied by the labor category.

Table 13: Labor Rates

Occupation Code	Occupation	Industry	Labor Category	Mean Hourly Wage	Total Labor Cost[1]
11-3071	Transportation, Storage and Distribution Managers	Oil and Gas Extraction	Manager	$64	$89
13-1041	Compliance Officers	Oil and Gas Extraction	Officer	$41	$66
43-9000	Other Office and Administrative Support Workers	Office and Administrative Support Occupations	Admin	$19	$44

Source: Bureau of Labor Statistics Occupational Employment Statistics (May 2015)
1. Mean hourly wage plus $25.01 per hour mean benefit

Table 14: One-time Cost of Reporting Process Development

Activity	Hours[1]	Labor Category	Cost
Revise current procedures to include gravity lines	16	Manager	$1424
Notify personnel and provide implementation guidance and instruction	4	Manager	$356
Total	**20**	**-**	**$1,780**

Source: Labor costs and categorization are based on Table 7
1. Hours and activities are based on operator survey data

To estimate the total process development cost, the cost per operator was multiplied by the number of operators ($1,780 x 942 =$1,676,760). **Table 15** shows the total annual compliance costs.

Table 15: Total Process Development Cost for Industry

One-time Component	Process Development Cost per Operator	Total Operators	Total Industry Cost
Process Development Cost for Industry	**$1,780[1]**	**942**	**$1,676,760**

1: Bureau of Labor Statistics Occupational Employment Statistics (May 2015) and operator survey data

Annual reporting and recordkeeping costs were developed using the same labor categories outlined in **Table 13**. Operator survey data was used to developed a list of activities to submit reports and the applicable hours associated for each activity. **Table 16** estimates the costs of reporting and recordkeeping.

Table 16: Annual Reporting and Recordkeeping Costs per Operator

Activity	Labor Category	Labor Cost[1]	Hours[2]	Cost
Cost of Reporting	Compliance Officer	$66	12	$792
Cost of Reporting	Administrative	$44	12	$528
Cost of Reporting	Manager	$89	8	$712
Cost of Recordkeeping	Administrative	$44	12	$528
Total	**-**	**-**	**44**	**$2,560**

1: Bureau of Labor Statistics Occupational Employment Statistics (May 2015) and operator data
2: Hours and activities are based on operator survey data.

To estimate the total reporting and recordkeeping costs, the total cost per operator was multiplied by the number of operators who much submit reports for each state ($2,560 x 1,416 =$2,411,520). **Table 17** shows the total annual compliance costs.

Table 17: Total Reporting and Recordkeeping Cost for Industry

Annual Component	Cost per Operator	Total Operators	Total Cost
Annual Reporting/Recordkeeping Cost for Industry	**$2,560[1]**	**1,416**	**$3,624,960**

1: Bureau of Labor Statistics Occupational Employment Statistics (May 2015) and operator data

Estimation of Inspection Unit Costs

Inspection costs are divided per mile for ILI and pressure tests. The RIA estimates operators would use ILI, PT or Direct Assessment. PT unit costs are included above.

Based on feedback from operators, P-PIC has determined the PRIA substantially underestimated the costs for conducting ILI and hydrostatic pressure tests. More realistic ILI cost estimates would take pipeline characteristics, such as urban and rural locations as well as elevation changes, into account. The primary drivers for pressure test costs are segment lengths, pipe diameter, procurement, agent costs, manifold installation costs, blowdowns, engineering costs, lost product, ROW clean up and return to service costs.

ILI Unit Cost

Table 18 outlines ILI costs for a 45-mile segment. The RIA determined that the cost per mile of ILI is $4,324 for interstate pipelines and $4,594 for intrastate pipelines or $194,580 or $206,730 for a 45-mile segment. Most operators use a combination of different inspection technologies to allow a more thorough assessment of the integrity of the pipeline.

The costs developed in **Table 18** are conservative and likely to increase based on technology improvements, demand and inflation costs. EMAT tools in particular are typically $1 million to $1.5 million for larger diameter runs and are necessary based on the new response condition requirements.

Table 18: ILI Assessment Cost per 45-mile Segment

Component	Onshore: 45 Mile Segments		
	26"-48"	14"-24"	4"-12"
Mobilization[1]	$28,125	$23,438	$18,750
MFL plus Caliper Tool	$168,750	$135,000	$101,250
Specialty Tools: EMAT plus Circumferential	$1,080,000	$900,000	$720,000
MFL and Circumferential Reruns[2]	$84,375	$67,500	$50,625
EMAT Reruns[3]	$432,000	$360,000	$288,000
Operator Preparation	$50,625	$43,219	$35,813
Total[4]	$1,843,875	$1,529,157	$1,214,438
Avg. Cost Per Mile		**$33,981**	

Source: T.D. Williamson, Inc., Houston, TX, Rosen Group, Houston, TX

1. Mobilization includes cost of mobilization and demobilization of construction work crew, material and equipment to/from the work site.

2. Reruns are 50% of MFL tool costs.

3. Reruns are 40% of EMAT cost

Direct Assessment Unit Cost

PHMSA estimated the following unit cost of Direct Assessment found on page 46 of the RIA is low. These costs are relatively double compared to PHMSA's estimates. **Table 19** shows the low, mid and high cost estimates.

Table 19: Direct Assessment Costs Per Mile

Component	Range of costs

	Low	Mid	High
Pre-assessment	$10,000	$15,000	$20,000
Indirect Inspection	$5,000	$20,500	$36,000
Direct Examination	$30,000	$35,000	$40,000
Post-assessment	$10,000	$15,000	$20,000
Total	**$55,000**	**$85,500**	**$116,000**

Assessment Method

Table 20 reports the Integrity Assessment percentages outlined in Table 3-34 of the RIA.

Table 20: MCA and Non-HCA Class 3 and 4 Assessment Method

Location	ILI	PT	DA and Other Method
Interstate			
Class 1 MCA	100%	0%	0%
Class 2 MCA	100%	0%	0%
Class 3 Non-HCA	60%	5%	35%
Class 4 Non-HCA	55%	5%	40%
Intrastate			
Class 1 MCA	100%	0%	0%
Class 2 MCA	100%	0%	0%
Class 3 Non-HCA	33%	10%	57%
Class 4 Non-HCA	62%	10%	28%

Source: RIA, pg. 55

Table 21 multiplies the percentages from **Table 20** with unit cost data for ILI, PT and DA.

Table 21: MCA and Non-HCA Class 3 and 4 Mileage

Location	ILI	PT	DA and Other Method
Interstate			
Class 1 MCA	113,156		
Class 2 MCA	11,742		
Class 3 Non-HCA	2,656	221	1,549
Class 4 Non-HCA	2	0	2
Intrastate			
Class 1 MCA	37,997		
Class 2 MCA	4,958		
Class 3 Non-HCA	1,113	337	1,923
Class 4 Non-HCA	60	10	27

Source: Table 13 and Table 20 data

Table 22 shows the total assessment cost. To calculate the total cost, the unit cost was multiplied by the estimated number of miles. Totals were divided and equally distributed over the compliance period (i.e., 1/15th each year for 15 years). The total annual cost for assessments in MCAs and Class 3 and 4 locations is approximately $429.5 million.

Table 22: Estimated Assessment Cost

Interstate	ILI	PT	DA
Class 1 MCA	$3,845,167,741		
Class 2 MCA	$399,001,150		
Class 3 Non-HCA	$90,256,943	$120,373,546	$132,471,990
Class 4 Non-HCA	$83,730		$191,520
Intrastate			
Class 1 MCA	$1,291,177,753		
Class 2 MCA	$168,492,676		
Class 3 Non-HCA	$37,834,517	$183,487,265	$164,427,991
Class 4 Non-HCA	$2,037,734	$5,260,020	$2,315,477
Total	$5,834,052,243	$309,120,831	$299,406,978
Annualized	$388,936,816.21	$20,608,055.42	$19,960,465.20

1.11 Annual Industry Total Compliance Cost for Topic 1 Compared to PHMSA Estimate

Table 23 is a comparison between industry's determinations of costs versus PHMSA costs. The total annual costs estimated by industry are $1.3 billion each year, the sum of interstate and intrastate costs. Compared to PHMSA's reported $26.8 million, this is significant cost difference.

Table 23: Topic 1 Annual Total Cost

Location	Industry Costs	PHMSA Costs
Interstate and Intrastate		
MAOP Untested HCA> 30% SMYS Mileage	$42,986,592	$2,215,052
MAOP Inadequate Records Mileage	$222,775,872	$10,569,323
MAOP Other Untested: 20-30% SMYS, Class 3&4, MCA Class 1&2	$349,455,322	$4,528,791
MAOP for Reportable In-Service Incidents without PT	$192,881,920	$0
MCA Identification (Interstate and Intrastate)	$86,931,643	$0
MCA Annual Reporting and Recordkeeping	$5,301,720	$0
MCA and non-HCA Class 3 Class 4 Assessments	$429,505,337	$9,511,538
Total	**$1,329,838,406**	**$26,824,704**
3% Discount (15-Yr)	$16,351,790,303.73	$329,838,522
7% Discount (15-Yr)	$12,959,897,611.52	$261,419,294
3% Annualized	$1,090,119,354	$21,989,235
7% Annualized	$863,993,174	**$17,427,953**

2.0 Topic 2: Integrity Management Program Process Clarification

The NPRM outlines clarifications to current regulations that affect the following areas:

1. Management of change process requirements (192.911)
2. Threat identification requirements for time-dependent threats (192.917)
3. Baseline assessment methods (192.921)
4. Repair criteria for remediating defects discovered in HCA segments
5. Preventive and mitigative (P&M) measures based on risk assessments (192.935(a))
6. P&M measures for covered segments or outside force damage (192.935(b))
7. Periodic evaluation and assessments specifically for plastic transmission pipelines (192.937)
8. Written notification for a 6-month extension of 7-year reassessment interval (192.939)

The majority of cost for topic area 2 pertains to the cost of new response conditions and data integration elements outlined in threat identification and periodic evaluation and assessments.

2.1 Data Integration Costs

The primary costs associated with additional elements to the geographic information system (GIS) are aerial imagery collection and historical data from ILI, CIS, Crack ILI, and corrosion tests per pipeline to be loaded into a database so that spatial relationships can be analyzed to identify potential integrity risks. This is a relatively new process for most operators and comes with significant complexity, planning, system upgrades, and IT capital investments.

For the purpose of cost estimates for this requirement, costs were collected from a diverse group of pipeline operators and validated data via IT vendors. Pipeline operators were segmented into four groups based on mileage: small (<300 miles), medium (300-2,000 miles), large (2,000-20,000 miles), and extra-large (> 20,000 miles). **Table 24** shows the number of operators by type for purposes of estimating IT costs.

Mileage calculations are based on the 2015 PHMSA data and segmented into small, medium, large and extra-large categories. Implementation costs vary based on size, with a majority of small operators, costs are calculated to reflect less cost these operators versus larger operators.

Table 24: Type Operator by Size for IT Estimates

Size of Operator	Average Mileage	Total
Small	< 300	828
Medium	300 to < 2,000	74
Large	2,000 to 10,000	36
X-Large	> 10,000	4
Affected Mileage	297,790	942

Source: PHMSA 2015 data

Table 25 includes costs elements of data integration, as part of an initial investment to meet the new requirement. One-time set-up costs and IT capital investments are combined with costs to load multiple historical data sets for each attribute into a spatial platform to allow for the integration among anomalous information.

Table 25: Elements of Data Integration: Initial Investment (one-time)

Components (per operator)	Small	Medium	Large	X-Large
IT Environment / Architecture Review	7,500	25,000	35,000	60,000
Set-up: Implementation & Data Loading	105,000	200,000	800,000	2,000,000
Risk Assessment	75,000	75,000	100,000	100,000
Visualization and Integrity Analysis	25,000	75,000	100,000	100,000
Documentation Costs	25,000	75,000	150,000	300,000
Total Initial Investment (per operator)	**$237,500**	**$450,000**	**$1,185,000**	**$2,560,000**
Total Industry Cost	**$196,650,000**	**$33,300,000**	**$42,660,000**	**$10,240,000**

** Total industry costs*

Source: Operator data and industry vendor: TRC, Kansas City, MO.

The types of one-time costs include:

IT Environment and System Architecture Review costs: it utilizes a standards Performance Optimized Datacenter System (PODS) model following ESRI (Environmental System Research Institute) spatial focus.

Implementation and Data Loading costs: this is the most significant aspect of the data set up cost estimates, representing the total initial investment to load and integrate data sets and attributes, including overlay of multiple sets of data. This includes: loading of data and alignment, determination of availability of data sources, including manual or existing database options.

Capture and alignment of integrity data costs include: In-Line Inspection (ILI) results, Close Interval Surveys (CIS), and Direct Current Voltage Current (DCVG) data. Costs estimates were captured from operators and validated thru vendor cost tables.

Risk assessment: a necessary component of data integration includes costs for development of algorithms and governance of data that manages risks.

Visualization and Integrity Analysis: includes the processes and procedures for updating critical data and understanding how to maintain data for pipeline attributes.

Documentation: involves a logical model for maintenance of data.

Table 26 outlines the annual costs associated with for data maintenance, including software fees, IT costs, servers and cloud storage costs.

Table 26: Elements of Data Integration: Maintenance Costs (annual)

Component per operator	Small	Medium	Large	X-Large
Operators	828	74	36	4
Data Maintenance per Operator	50,000	100,000	300,000	600,000
Industry Annual maintenance costs - $k	**41,400,000**	**7,400,000**	**10,800,000**	**2,400,000**

Source: Operator data and industry vendor: TRC, Kansas City, MO.

Table 27 includes labor costs for analysis required to identify interactions between threats and conditions affecting a pipeline that can be used to set priorities for dealing with identified issues. Labor costs are based on an industry-estimated average of $70.01/hour and estimates from operators regarding the number of full-time personnel required to carry out this activity. Other costs associated with training, development, and turnover management for this type of activity are not included due to nature of new roles.

Table 27: Elements of Data Integration: Analytical Costs (annual)

Component per operator	Small	Medium	Large	X-Large
Operators	828	74	36	4
FTE Required for Analysis ($70/hr.)	0.5	.8	2	3
Total Hours[1]	1008	1612.8	4032	6048
Total FTE required	414	59.2	72	12
Annual FTE costs - $k	**$29,216,013**	**$6,684,398**	**$20,324,183**	**$5,081,046**

Source: Operator data and industry vendor

1. Based on 8 hours a day x 21 work days in a month x 12 months

Table 28 outlines the total data integration costs to satisfy enhanced requirements for the integration and analysis of twenty-one pipeline attributes, including an overlay of multiple data sets (data integration) for the purpose of identifying where these relationships could result in increased pipeline risk.

Utilizing operators and industry vendor data, P-PIC estimates one-time investments costs at $283 million. At a minimum, an implementation schedule between seven and ten years is recommended by industry IT experts to carryout this effort for the whole industry.

Further, to evaluate and analyze spatial relationships to identify potential integrity risks, industry personnel will be required to carry out this activity. This is a relatively new

process for most operators and comes with significant complexity, planning, training requirements, personnel and management development. P-PIC estimates the annual FTE costs at $123 million.

Table 28: Total Data Integration Costs

Component per operator	Total
One-time Setup	$282,850,000
Annual Maintenance and Analysis	$123,305,640
Total	**$406,155,640**

Source: Operator data and industry vendor: TRC, Kansas City, MO.

Overall, total data integration costs, including one-year of maintenance and analysis at $406 million.

2.2 Estimated Cost of Response Conditions, Repairs and Replacements

The proposed rule will require operators to excavate specific areas once an assessment is performed that identifies areas of concern. The majority of assessments will be ILI versus other methods. As such, ILI will detect more areas needing to be excavated based on new immediate, 1 year and 2 year response condition criteria. This leads to far more excavations post-assessment for each operator.

To estimate the cost for changing the response condition criteria as proposed in the NPRM, industry analyzed over 12,000 miles of previously assessed data points to compare the total number of current response conditions versus the number of new response conditions. This effort resulted in generating response per mile estimates for each condition.

Cost estimates were generated using the following methodology:

1. Estimating the mileage and the response conditions per mile in piggable HCA areas and piggable MCA and other areas.
2. Estimating the cost per response condition
3. Estimating the repairs and replacement rates based on the total number of response conditions
4. Estimating unit costs for repairs and replacements
5. Calculating the total cost of response, repair and replacement

Response Condition Mileage Estimate

To generate mileage estimates and regulatory impact, industry analyzed more than 50,000 miles of transmission pipeline across multiple entities to establish areas with

piggable HCAs and piggable MCA and other area locations. **Table 29** outlines the piggable mileage and associated responses.

Responses per mile rates are calculated based on input from operators regarding the number of incremental of responses required by the new regulation. To estimate the cost for changing the response condition criteria as proposed in the NPRM, industry analyzed over 12,000 miles of previously assessed data points across multiple entities to compare the total number of current response conditions versus the number of new response conditions. This effort resulted in generating response per mile estimates for each condition. Responses per mile reflect the net change.

Table 29: Estimated Miles Affected by Proposed Response Conditions

Location	Miles Affected
HCAs based on 192.933 Response	14,023[1]
Non-HCA Response Based on 192.713	167,320[2]

1. *Total piggable HCA mileage established from PHMSA 2014 Annual Report – Part R.*
2. Piggable mileage calculated by using the total Non-HCA miles in Table 3-3 on page 35 of the RIA and multiplying it by the percent piggable values contained in Table 3-33 on page 54 of the RIA. Mileage affected by requirements proposed by PHMSA in proposed 192.713 were established based on a sample of industry data including: a)Non-HCA piggable miles assessed due to present HCA rules (59.5%, 104,575 miles) and b) Non-HCA incremental ILI assessment required due to proposed MCA requirements in 192.710 (37.7%, 62,745 miles). This total does not consider additional pipe made piggable going forward.
3. Responses per mile based on industry sample of incremental response criteria including immediate and scheduled conditions.

To calculate the cost per response, a representative sample of all transmission mileage was analyzed to determine the response per mile for Immediate and 1-year conditions for HCAs and Immediate and 2-year responses for piggable non-HCAs. Mileage is multiplied by the response per mile rate to arrive at the total responses. Cost per condition was derived a similar way. Industry estimated the average cost per response condition. Total conditions were multiplied by the unit response condition cost. Tables 30 through 33 outline the total costs for immediate, 1-year and 2-year response conditions.

Table 30: Incremental Costs for Immediate Response Conditions in HCAs based on NPRM 192.933 Requirements

Conditions	Conditions Per Mile[3]	Mileage[1]	Total Conditions[3]	Cost Per Condition[3]	Total Cost[5]
Metal Loss affecting a high frequency ERW seam[2]	0.169	2,103	355	$40,000	$14,200,000
Total New Response Condition Cost[2]					**$14,200,000**

1. Established by multiplying total piggable HCA mileage reference in INGAA Table 29 and multiplying by the total estimated amount of high frequency ERW pipe (14,023 piggable HCA miles x 15% High Frequency ERW pipe = 2,103 Miles of total HF-ERW). Percentage of industry HF-ERW pipe estimated from a sample of over 60k miles of pipe across multiple entities.
2. Metal loss on high frequency ERW pipe is not presently required and is therefore an incremental cost relative to the present regulations. Metal loss associated with high frequency ERW pipe is not considered injurious in accordance with consensus industry standards.
3. Established based on operator survey data.
4. Calculated by multiplying the conditions per mile by the newly impacted mileage based on the proposed new criteria within 192.933.
5. Total Conditions multiplied by cost per condition. Includes costs to excavate and evaluate a condition and recoat. This does not include pipe repair if required.

Table 31: Incremental Cost for One-Year Conditions in HCAs based on NPRM 192.933 Requirements

Conditions	Conditions Per Mile	Affected Mileage	Total Conditions[6]	Cost per Response[4]	Total Cost[5]
Predicted failure pressure by Class[1]	0.005	14,023[1]	70	$40,000	$2,800,000
Corrosion with predicted metal loss greater than 50%	0.202	14,023[1]	2,832	$40,000	$113,280,000
50% nominal wall loss located at a pipeline crossing, widespread circumferential corrosion, or could affect a girth weld[2]	-	-	-	-	-
Gouge or groove greater than 12. 5% of nominal wall[3]	-	-	-	-	-
Total New Response Condition Cost					**$116,080,000**

1. Affected HCA mileage was determined as established in INGAA Table 29.
2. Costs for the 50% metal loss criterion associated with crossings, widespread corrosion or affecting a girth weld is captured in the stand-alone 50% criteria since the second 50% criterion is redundant.
3. ILI technology does not reliably discriminate metal loss resulting from gouges versus metal loss from corrosion. Therefore, this could not be an in-line inspection response condition.
4. Established based on operator survey data.
5. Total Conditions multiplied by cost per condition. Includes costs to excavate and evaluate a condition and recoat. This does not include pipe repair if required.
6. Conditions per mile multiplied by the affected mileage.

Table 32: Incremental Immediate Response Conditions for Non-HCAs Based on Requirements in NPRM 192.713

Conditions	Conditions Per Mile	Mileage	Total Conditions [8]	Cost Per Condition	Total Cost[7]
Predicted Failure Pressure less than or equal to 1.1 x MAOP[1]	-	-	-	-	-
Dent with any metal loss, cracking or a stress riser[6]	0.066	167,320[2]	11,043	$40,000[5]	$441,724,800

Metal Loss Defects that Exceed 80% wall thickness[1]	-	-	-	-	-
Metal Loss affecting an ERW or EFW seam[6]	0.169	78,640[3]	13,290	$40,000[5]	$531,600,000
Significant SCC[4]	(Not Reported by ILI)	-	-	-	-
Metal-Loss Affecting a Detected Longitudinal Seam and SSSC[4]	(Not Reported by ILI)	-	-	-	-
Total Incremental Response Condition Cost					**$973,324,800**

1. This potentially injurious condition would already be addressed by pipeline operators.
2. Piggable mileage in non-HCAs established as indicated in INGAA Table 29.
3. Piggable mileage affected by the requirement to address LF-ERW, HF-ERW, and EFW metal loss was established by estimating the amount of based on an sample of approximately 60k miles across multiple entities (47% x 167,320 miles = 78,640 miles of affected pipe). An estimated 47% of industry pipe contains one of these types of seam.
4. ILI technology does not report SCC and SSWC and therefore these conditions would not represent an in-line inspection response condition. ILI only detects crack and crack-like features.
5. Established based on operator survey data.
6. Not a condition presently requiring action by pipeline operators.
7. Total Conditions multiplied by cost per condition. Includes costs to excavate and evaluate a condition and recoat. This does not include pipe repair if required.
8. Conditions per mile multiplied by the affected mileage.

Table 33: Incremental Two-Year Conditions for Non-HCAs Based on Requirements in NPRM 192.713

Conditions	Conditions Per Mile[5]	Mileage	Total Conditions[7]	Cost per Response	Total Cost[6]
Top Side Dents greater than 6%	0.001	167,320[1]	167	$40,000	$6,680,000
Dent with depth greater than 2% of pipeline diameter (.25" in depth for 12" pipeline) that affects pipe curvature at a girth weld or at a longitudinal or helical seam weld	0.028	167,320[1]	4,685	$40,000	$187,400,000
Predicted failure pressure by Class	.005	167,320[1]	837	$40,000	$33,480,000
Corrosion with predicted metal loss greater than 50%	0.202	167,320[1]	33,799	$40,000	$1,351,960,000
50% nominal wall loss located at a pipeline crossing, widespread circumferential corrosion, or could affect a girth weld[2]	-	-	-	-	-
Gouge or groove greater than 12. 5% of nominal wall[3]	-	-	-	-	-
Indication of crack or crack-like defect other than immediate	0.536	117,124[4,5]	62,778	$40,000	$2,511,120,000

condition using Circumferential Tool (Seam anomalies only)[8]					
Indication of crack or crack-like defect other than immediate condition using EMAT (Pipe body anomalies only)[9]	0.187	117,124[4,5]	21,902	$40,000	$876,080,000
Cost of Response					**$4,966,720,000**

1. Piggable mileage in non-HCAs established as indicated in INGAA Table 29.
2. Costs for the 50% metal loss criterion associated with crossings, widespread corrosion or affecting a girth weld is captured in the stand-alone 50% criteria since the second 50% criterion is redundant.
3. ILI technology does not reliably discriminate metal loss resulting from gouges versus metal loss from corrosion. Therefore, this could not be an in-line inspection response condition.
3. Gouges and grooves are not reported using an ILI tool. ILI only detects crack and crack-like features.
4. Assumes 70% of non-HCA piggable mileage can be pigged by these specialty tools and the piggable segment would be potentially subject to assessment based on requirements in NRPM 192.710.
5. Estimate based on a sample from INGAA members.
6. Total Conditions multiplied by cost per condition. Includes costs to excavate and evaluate a condition and recoat. This does not include pipe repair if required.
7. Conditions per mile multiplied by the affected mileage.
8. These anomalies are reported from a circumferential MFL tool as Seam Weld Feature A and Seam Weld Feature B anomalies. SWF-A anomalies are most crack-like and SWF-B anomalies are less crack-like but would fit the proposed criteria. These anomalies are typically non-injurious and are considered stable if subjected to a prior pressure test.
9. Includes crack or crack-like defects reported from an EMAT tool. This number does not reflect the actual number of cracks or crack-like defects since EMAT will typically report more crack-like defects than actually verified on the pipeline.

Repair and Replacement Cost Estimates

Based on industry data, the average cost to repair an identified anomaly is $20,000 and replacement of pipe is $130,000. The cost estimates for response conditions include re-coating, excavation or evaluation cost and are not reflected in the cost estimates for repairs or replacement. Permanent field repairs consist of cutting out and replacing a cylindrical piece of pipe or repairing the pipe using welded split sleeves, bolt-on leak clamps, composite wraps or other methods. **Table 34** outlines the average cost per repair and replacement.

Table 34: Repair and Replacement Costs

Repair and Replacement Cost	Cost
Avg. Cost per Repair	$20,000
Avg. Replacement Cost	$130,000

Source: Operator Survey Data

Based on industry feedback, the majority of response conditions do not require further action. Approximately 5-percent of all conditions require either a repair or replacement regardless of condition location. **Table 35** shows the percentages by condition type.

Table 35: Percentage of Repairs and Replacements

Conditions Type	Total Response Conditions	No Repair No Replace	Repair	Replacement
Immediate Conditions	24,688	90%	5%	5%
1-Year Conditions	2,902	90%	5%	5%
2-Year Conditions	124,168	90%	5%	5%

Source: Operator Survey Data

The majority of immediate and 2-year conditions will have no associated repair or replacement. Industry estimates that 9% of response conditions will be repaired or replaced once a response condition is identified. **Table 46** multiplies the number of repairs and replacements by cost. The total repair and replacement cost is $1,139,280,000.

Table 36: Repair and Replacement Cost

Conditions Type	No Repair No Replace	Repair	Replacement	Repair Costs	Replacement Costs
Immediate Conditions	24,688	1,234	1,234	$24,688,000	$160,472,000
1-Year Conditions	2902	145	145	$2,902,000	$18,863,000
2-Year Conditions	124,168	6,208	6,208	$124,160,000	$807,040,000
Total Cost				**$151,750,000**	**$986,375,000**

Source: Operator Survey Data

RIA Comparison

PHMSA estimated the number of 180-day conditions which could occur on regulated segments. PHMSA assumes that a similar proportion of hazardous liquid conditions would apply to gas transmission. PHMSA estimates that approximately 81% of repair conditions will be 180-day conditions. PHMSA assumes a 0.107 discovery rate for gas transmission. In addition, PHMSA assumed a repair schedule of 5 years and developed costs based on the difference between the cost of a repair performed the same year once a condition is discovered (i.e. the repair is accelerated by 4 years).

PHMSA does not report a cost estimate for MCA and other pipe that would be affected by this requirement nor do they take into consideration how ILI impacts the number of response conditions. **Table 37** outlines the industry costs versus PHMSA costs.

Table 37: Total Compliance Cost for Response Conditions, Repair and Replacements

Location	Industry Costs for Response Conditions	Industry Costs for Repairs and Replacements	7 Year Costs	15 Year Costs	PHMSA Costs
Immediate Response Conditions in	$14,200,000	$2,662,500	$16,862,500[2]		

HCAs[2]					
Immediate Response Conditions in MCAs and Other	$973,324,800	$182,497,500	$722,388,938[3]	$433,433,363[4]	
1-Year Response Conditions[2]	$116,080,000	$21,765,000	$137,845,000[2]		$3,400,000[1]
2-Year Response Conditions	$4,966,720,000	$931,200,000	$3,686,200,000[3]	$2,211,720,000[4]	-
Total	**$6,070,324,800**	**$1,138,125,000**	**$4,563,296,438**	**$2,645,153,363**	**$3,400,000**

Source: Industry Survey Data and RIA Table 3-65 page 78-79

1. PHMSA estimates the annual cost for performing one-year repairs with present value of those same repairs if done five years in the future. The delay cost is subtracted from the annual cost.
2. All pipe within HCA's is subject to reassessment intervals of 7-years.
3. Non-HCA pipe assessed on a 7–year interval includes the pipe that would be subject to inspection based on the current HCA rules in Subpart O and also therefore subject to response conditions within proposed 192.713 upon discovery. The approximately length of piggable mileage subject to a 7-year inspection frequency is the total non-HCA miles assessed based on the present HCA rules (104,575 miles) divided by the total miles of piggable Non-HCA pipe subject to 192.713 (167,320 miles). 104,575 miles /167,320 miles = 62.5%.
4. Non-HCA pipe subject to a 15-year period includes piggable pipe that requires assessment under requirements in proposed 192.710 that is not already assessed due to Subpart O requirements. The total length of incremental pipe that would be assessed based on proposed 192.710 requirements not already subject to assessment due to Subpart O requirements is 62,745 miles compared to a total affected miles of 167,320. 62,745 miles /167,320 miles = 37.5%

2.3 Annual Industry Total Compliance Cost for Topic 2 Compared to PHMSA Estimate

Table 38 is a comparison between industry's determination of costs versus PHMSA costs. PHMSA estimates minimal costs associated with Topic 2. Industry estimates that this area alone will add exponential costs to industry.

Table 38: Topic 2 Annual Total Cost

Location	Industry Annual Costs	PHMSA Costs
Interstate and Intrastate		
Response Conditions, Repair, Replacement	$7,208,449,800	$3,400,000
Data Integration	$406,155,640	-
Total	**$7,614,605,440**	**$3,400,000**
3% Discount Total	$9,920,224,809	$19,400,000
7% Discount Total	$8,530,108,727	$32,700,000
3% Annualized	$1,099,031,726	$1,300,000
7% Annualized	**$956,834,611**	**$2,200,000[1]**

Based on Table 37, 7 year and 15-year calculations.

1. RIA incorrectly reports the 3% discount cost as the 7% cost.

3.0 Topic 3: Management of Change Process Improvement

The proposed rule would require gas transmission operators to have new MOC processes in place. PHMSA assumes that approximately 20% of operators do not have IM programs and would have to develop processes to implement the new MOC requirement. They assume that a typical pipeline system has 8 compressor stations and 3 piping segments. A typical pipeline system would have 1 compressor station change event and 3 piping section change events per year. PHMSA estimates that approximately 350 operators do not have IM programs. Of that, 20% (~70 operators) would have to develop a process to implement the new MOC rule.

To calculate the cost of revising MOC plans, PHMSA estimated hours required and labor costs for administrative personnel, engineers, senior engineers, and pipeline operator management. Industry costs used the PHMSA rates for Senior Engineer and Supervisory, but added in other personnel who would contribute to the effort.

Table 39 reports on the applicable labor rates that are dedicated to supporting MOC plan revisions. Labor rates were applied based on a breakdown by activity and associated level of effort.

Table 39: Labor Rates

Occupation Code	Occupation	Industry	Labor Category	Mean Hourly Wage	Total Labor Cost[1]
17-2000	Engineer	General	Engineer	$45.79	$70.01
43-9000	Other Office and Administrative Support Workers	Office and Administrative Support Occupations	Admin	$19	$44
15-1121	Computer Systems Analyst	Computer	Analyst	$43.56	$68.57
53-1031	Supervisors of Transportation	Transportation and Material Moving Occupations	Supervisor	$26.10	$51.11
-	Senior Engineer	Oil and Gas	Engineer	$79.89	$104.9
-	Supervisor	Oil and Gas	Engineer	$78.05	$103.06

Source: Bureau of Labor Statistics Occupational Employment Statistics (May 2015)
1. Mean hourly wage plus $25.01 per hour mean benefit

To calculate the total cost impact of the rule, P-PIC multiplied the labor rates by the applicable hours for each activity. Total costs of creating and updating MOC procedures

were estimated by multiplying the estimated number of hours by the wage for each type of personnel. Data is shown in **Table 40**.

Table 40: One-Time Cost of Revising MOC –Small, Medium, Large and X-Large Operators

Occupation	Labor Rate	Hours for Updating Procedures Small Company	Hours for Updating Procedures Medium Company	Updating Procedures Large Company	Updating Procedures X-Large Company
		Small	Medium	Large	X-Large
		828	74	36	4
FTE	$70.01	.2	.5	1	2
Hours		403	1,008	2016	4032
Total		$28,228	$70,570	$141,140	$282,280
Total	-	$23,372,810	$5,222,186	$5,081,046	$1,129,121
Total Industry					**$34,805,163**

Source: Operator Survey Data, based on 2016 working hours per year (8 hrs. per day x 21 work days a month x 12 months)

Cost of Implementing MOC

PHMSA incorrectly assumes that only 20% of operators would be impacted by the proposed MOC requirement. However, the majority of operators who already implement MOC related to Integrity Management capture only major changes and is currently a more manual process. The proposed changes by PHMSA expand MOC to all regulations and facilities, including tracking MOCs for design, operational and maintenance changes. **Table 41** outlines the mileage and MOCs per mile.

Number of Annual MOC Events

Table 41: Number of Annual MOC Events

Component	Total
Total Mileage	297,790
Estimated MOC per Mile[1]	1
Total MOC Events Per Year	**297,790**

Source: Operator data

1. Based on 50 miles per tech, 6,040 number of techs, 1 MOC per week per tech, 49 working weeks per year, 0.5 hours per MOC, 147,980 MOC work hours at $25/hr.

Operators estimate that the majority of MOC events will be relatively small and require less time to implement. Industry assumes that 97% of MOC will take two hours to complete, whereas a large change could take up to 500 hours. Large events are

estimated at .5 percent of all MOC events since they are infrequent. Small changes are less time intensive and easier to implement. Conversely, large changes demand multiple departmental involvement, thorough reviews, significant documentation collection and in some cases, historical record updates, such as engineering records, as-builts, and other risk-related documentation. The cost per small, medium and large MOC event are outlined in **Table 42**.

Table 42: Cost per MOC Event

Component	Labor Rate	Small MOC Change	Medium MOC Change	Large MOC Change	Small MOC Change	Medium MOC Change	Large MOC Change
Personnel Identifies Change	$70.01	.25	2	10	$35.01	$140	$7,001
Obtain Approval for Change	$104.90	.25	1	50	$52.45	$105	$10,490
Evaluate and Document Change	$104.90	.25	24	70	$52.45	$2,518	$52,450
Obtain Work Authorization	$103.06	.25	4	20	$51.53	$412	$25,765
Formally Institutionalize Change	$104.90	.25	40	100	$52.45	$4,196	$41,960
Communicate Change	$103.06	.25	2	50	$51.53	$206	$20,612
Train and Qualify Personnel	$104.90	.50	80	200	$52.45	$8,392	$20,980
Total	-	2	153	500	$348	$15,969	$179,258
Estimated Number of Annual Events	-	97%	2.5%	.5%	288,856	7,445	1,489
Total Cost to Industry					$100,482,997	$118,884,319	$77,384,156
Total							**$296,751,472**

Source: Operator Survey Data

Electronic System

The majority of operators do not have an electronic Management of Change system in place. To do so will be an upfront capital cost of the hardware and software and an annual maintenance costs.

Table 43 illustrates the one-time cost elements and the annual cost of implementing MOC compared to PHMSA costs.

Table 43: Total MOC Compliance Cost

Element	Industry Cost	PHMSA Cost
Average One-Time Cost of Revising MOC	$34,805,163	$426,281
Annual Cost of Implementing MOC	$296,751,472	$977,760
Total Cost	$354,566,063	$1,404,041
3% Discount (10-Yr)	$2,607,290,756	$12, 448,803
7% Discount (10-Yr)	$2,230,156,232	$9,954,924
3% Annual Cost	$295,534,239	$829,920
7% Annual Cost	$257,820,786	$663,662

Source: RIA and Operator Data

1. Assumes 10 years of annual implementation costs + one time MOC procedures

4.0 Topic 4: Corrosion

The NPRM proposes new regulations and changes to existing regulations in the following areas:

1. Coating condition survey requirements [192.319(d), 461(f) and 935(g)(2)(ii)]
2. Close-interval survey requirements [192.465(f) and 935(g)(2)(iv)(A)]
3. Requirements for test lead spacing in high-consequence areas [192.935(g)(2)(iv)(B)]
4. Requirements for interference surveys [192.473(c)(1) and 935(g)(1)(i)(A)]
5. Gas quality monitoring [192.478(a) and 935(f)(2)]

4.1 External Corrosion Coating

The proposed rule would require coating surveys when an operator does a repair with an excavation of 200 feet or more. Compared to PHMSA, operators estimate 2,500 surveys will result from the requirement compared to 240 reported by PHMSA. In addition, the cost per survey averages to be $3,000, regardless of class location. The costs for coating surveys are outlined in **Table 44**.

Table 44: External Corrosion Coating Survey Cost

Element	Operator reported # of Coating Survey Miles	Cost of Survey per Mile (Avg.)	Total Survey Cost	Anomalies per Mile	Total Anomalies	Low Cost to Repair	High Cost to Repair	Average Cost to Repair	Total
New Construction	2000	$3,000	$6,000,000	2	4000	$25,000	$50,000	$37,500	$150,000,000
Repair/Replacement >than 1,000 feet	500	$3,000	$1,500,000	2	1000	$25,000	$50,000	$37,500	$37,500,000
Every 7 years in HCA	2,832	$3,000	$8,496,000	6	16992	$25,000	$50,000	$37,500	$637,200,000
Total			**$15,996,000**						**$824,700,000**
							Total Cost		**$840,696,000**

Source: Operator Data

4.2 External Corrosion Monitoring CIS

The proposed rule would require CIS when a test station reading indicates low cathodic protection (CP). CIS would be required in both directions of a test station. Industry assumes that in total one-mile would need surveying once an out of compliance is located. Industry also questions the .5 % out of compliance rate reported in the RIA. Based on operator survey data industry assumes that 1 percent of test stations would be out of compliance. In addition, CIS would be required in HCAs every 7 years, which

seems to unaccounted for in the PHMSA RIA. Industry does not agree with the current compliance rates indicated in the RIA. **Table 45** shows the total CIS survey cost.

Table 45: External Corrosion CIS Survey Cost

Element	Mileage and # of Test Stations	Out of compliance	Average Survey Mile	Total Miles	Cost to CIS/Mile	Total Survey Cost
Test Stations along Pipeline	297,826	1%	1	2,978	$3000	$8,934,780
Every 7 years in HCA	2,832	-	1	2,832	$3000	$8,496,000
Resurvey Test Stations	2,978	-	1	2,978	$3,000	$8,934,000
Total						**$26,364,780**

Source: Operator Data

4.3 Cost of Adding Test Stations in HCAs

The proposed rule would require pipe-to-soil test stations be located at half-mile intervals within each HCA segment. Currently industry has a least one station within one-mile intervals. For cost development, industry is using the new station estimate of new station needed according to the RIA Table 3-73. The cost to add a test station reported by PHMSA at $500 is low compared to the industry average of $3,500 shown in **Table 46**.

Table 46: Cost to Add a Test Station in HCAs

HCA Miles	New Stations (PHMSA)	Cost per Station Low	Cost per Station High	Avg. Cost per Station	Total Station Cost
19,872	7,949	$2,500	$5,000	$3,750	$29,808,750
Total					**$29,808,750**

Source: Operator Data and RIA pg. 89

4.4 Interference Current Surveys

The proposed rule would require interference current surveys as proposed in 192.473(c) if stray current is found. Part 192.935 (g)(1) would require periodic surveys whenever needed, but not to exceed every 7 years. Compliance totals are shown in **Table 47**.

Table 47: Interference Current Surveys

HCA Miles	Cost to Survey	Incremental Need to Survey	Compliance Mileage	Total Cost
42,546[1]	$14,000	1%	425	$5,950,000
Total				**$5,950,000**

Source: Operator Data and RIA pg. 90

1. Mileage based on 1/7 of total mileage

4.5 Internal Corrosion Monitoring

The proposed rule would require interference internal corrosion monitoring for CO_2, sulfur, water and other chemicals. PHMSA reports that the cost for monitoring is relatively inexpensive.

PHMSA drastically underestimates monitoring equipment costs. **Table 48** outlines industry estimates for costs to add continuously monitoring equipment in HCA that range from $200,000 to $350,000. In addition, the current compliance rates are not applicable. Therefore, costs are calculated using the total number of monitors needed according to PHMSA without applying the compliance factor.

Table 48: Internal Corrosion Monitoring Cost

	Number of Monitors	Low Cost of Monitoring Equipment	High Cost of Monitoring Equipment	Average Cost of Monitoring Equipment	Total Cost
Continuous Monitoring Equipment HCA	**180**	$200,000	$350,000	$275,000	$49,500,000
Monitoring Equipment Non-HCA	**650**	$30,000	$50,000	$40,000	$26,000,000
	Total				**$75,500,000**

Source: Operator Data and RIA pg. 91

Table 49 is the total corrosion compliance cost compared to PHMSA costs. The totals are discounted based on different compliance schedules.

Table 49: Total Corrosion Compliance Cost

Component	Industry One-Time	Industry Annual	Industry Recurring (7 Years)	PHMSA One-Time Cost	PHMSA Annual	PHMSA Recurring (7 years)
External Corrosion Coating		$840,696,000		-	$298,000	
External Corrosion Monitoring	$29,808,750	$26,364,780		$3,974,492	$6,602,718	
Interference Current Surveys			$5,950,000			$1,829,877
Internal Corrosion Monitoring	$75,500,000	-		$400,000		
Total Cost	$105,308,750	$867,060,780	$5,950,000	$4,374,492	$6,900,718	$1,829,877
3% Discount	$105,308,750	$10,661,442,767	$73,161,635	$4,374,492	$84,851,733	$11,742,668
7% Discount	$105,308,750	$8,449,913,073	$57,985,534	$4,374,492	$67,250,726	$10,552,056

Source: PRIA and Operator Data

1. One-time cost in year 1; annual costs in years 1-15 years; and 7-year recurring costs annualized over 7 years.

The total present value for industry versus PHMSA costs are reflected in **Table 50**.

Table 50: Present Value Cost, Topic Area 4

	Total 7%	Average Annual (7%)	Total 3%	Average Annual (3%)
Industry Costs	$8,613,207,357	$672,501,990	$10,839,913,152	$820,949,043
PHMSA Costs	$94,788,018	$6,319,201	$118,451,243	$7,896,750