Appendix E:

Burden and Cost for Petroleum and Natural Gas Systems

(Subpart W)

June 2019

Appendix E-1. Detailed Unit Burden and Costs for Petroleum and Natural Gas Systems (Subpart W)—Years 1 - 3

Year 1-3	Hours per Occurrence	Occurrences/ Respondent/Year	Hours/ Respondent/ Year	Respondents/ Year	Engineer Hours/Year	Technician Hours/Year	Middle Manager Hours/Year	Senior Manager Hours/Year	Lawyer Hours/Year	Cost/ Year
1. APPLICATIONS (Not Applicable)										
2. SURVEY AND STUDIES (Not Applicable)										
3. ACQUISITION, INSTALLATION, AND UTILIZATION OF TECHNOLOGY AND SYSTEMS										
4. REPORT REQUIREMENTS										
A1. Read Rule, Instructions, Guidance Documents for Subpart W										
Onshore Natural Gas Processing reporters 1,2,3,4	5.00	1	5.00	449	2,245.0	-	224.5	112.3	449.0	$294,434
Onshore Natural Gas Transmission Compression reporters 1,2,3,4	5.00	1	5.00	532	2,660.0	-	266.0	133.0	532.0	$348,862
Underground Natural Gas Storage reporters 1,2,3,4	5.00	1	5.00	48	240.0	-	24.0	12.0	48.0	$31,476
LNG Import and Export Equipment reporters 1,2,3,4	5.00	1	5.00	6	30.0	-	3.0	1.5	6.0	$3,935
Onshore Petroleum and Natural Gas Production reporters 1,2,3,4	5.00	1	5.00	497	2,485.0	-	248.5	124.3	497.0	$325,910
Natural Gas Distribution reporters 1,2,3,4	5.00	1	5.00	169	845.0	-	84.5	42.3	169.0	$110,823
LNG Storage reporters 1,2,3,4	5.00	1	5.00	6	30.0	-	3.0	1.5	6.0	$3,935
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 1,2,3,4	5.00	1	5.00	321	1,605.0		160.5	80.3	321.0	$210,497
Natural Gas Transmission Pipeline reporters 1,2,3,4	5.00	1	5.00	33	165.0		16.5	8.3	33.0	$21,640
Offshore Petroleum and Natural Gas Production reporters 2,3,4,5	1.00	1	1.00	141	141.0	-	14.1	7.1	141.0	$31,152
A2. Read Rule, Instructions, Guidance Documents for Subpart A										
Onshore Natural Gas Processing reporters 4,6	5.00	1	5.00	449	2,245.0	-	224.5	112.3	449.0	$294,434
Onshore Natural Gas Transmission Compression reporters 4,6	5.00	1	5.00	532	2,660.0	-	266.0	133.0	532.0	$348,862
Underground Natural Gas Storage reporters 4,6	5.00	1	5.00	48	240.0	-	24.0	12.0	48.0	$31,476
LNG Import and Export Equipment reporters 4,6	5.00	1	5.00	6	30.0	-	3.0	1.5	6.0	$3,935
Onshore Petroleum and Natural Gas Production reporters 4,6	5.00	1	5.00	497	2,485.0	-	248.5	124.3	497.0	$325,910

Year 1-3	Hours per Occurrence	Occurrences/ Respondent/Year	Hours/ Respondent/ Year	Respondents/ Year	Engineer Hours/Year	Technician Hours/Year	Middle Manager Hours/Year	Senior Manager Hours/Year	Lawyer Hours/Year	Cost/ Year
Natural Gas Distribution reporters 4,6	5.00	1	5.00	169	845.0	-	84.5	42.3	169.0	$110,823
LNG Storage reporters 4,6	5.00	1	5.00	6	30.0	-	3.0	1.5	6.0	$3,935
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 4,6	5.00	1	5.00	321	1,605.0	-	160.5	80.3	321.0	$210,497
Natural Gas Transmission Pipeline reporters 4,6	5.00	1	5.00	33	165.0	-	16.5	8.3	33.0	$21,640
Offshore Petroleum and Natural Gas Production reporters 4,6	5.00	1	5.00	141	705.0	-	70.5	35.3	141.0	$92,461
B. Required Activities										
Acid Gas Removal Units										
Gather CEMS data for e-GGRT reporting (M1)										
Onshore Natural Gas Processing reporters 3,7,8,13	1.00	1.3	1.25	4	5.0		0.5	0.3		$544
Onshore Petroleum and Natural Gas Production reporters 3,7,81	1.00	0.0	0.00	0	-		-	-		$0
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 3,7, 81	1.00	0.0	0.00	0	-		-	-		$0
Conduct quarterly gas sampling (M2)										
Onshore Natural Gas Processing reporters 3,12,13,14	0.67	1.4	0.93	61	56.9		5.7	2.8		$6,189
Onshore Petroleum and Natural Gas Production reporters 3,12,81	0.67	0.0	0.00	0	-		-	-		$0
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 3,12,13	0.67	11.0	7.33	11	80.7		8.1	4.0		$8,769
Perform engineering calculation (M3)										
Onshore Natural Gas Processing reporters 13,90	0.17	1.4	0.23	110	25.7		2.6	1.3		$2,790
Onshore Petroleum and Natural Gas Production reporters 13,90	0.17	3.2	0.53	10	5.3		0.5	0.3		$580
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 13,90	0.17	3.0	0.50	25	12.5		1.3	0.6		$1,359
Perform simulation run using AspenTech HYSYS®, or API 4679 AMINECalc (M4)										
Onshore Natural Gas Processing reporters 13,91	0.42	1.6	0.67	76	50.7		5.1	2.5		$5,508
Onshore Petroleum and Natural Gas Production reporters 13,91	0.42	1.3	0.54	6	3.3		0.3	0.2		$353

Year 1-3	Hours per Occurrence	Occurrences/ Respondent/Year	Hours/ Respondent/ Year	Respondents/ Year	Engineer Hours/Year	Technician Hours/Year	Middle Manager Hours/Year	Senior Manager Hours/Year	Lawyer Hours/Year	Cost/ Year
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 13,91	0.42	2.0	0.83	21	17.5		1.8	0.9		$1,902
Equipment Leaks										
Conduct Leak Detection Surveys and Perform Emission Calculations										
Onshore Natural Gas Processing reporters 3,18	4.00	1.0	4.00	449	1,796.0		179.6	89.8		$195,234
Onshore Natural Gas Transmission Compression reporters 3,18	4.00	1.0	4.00	532	2,128.0		212.8	106.4		$231,324
Underground Natural Gas Storage reporters 3,18	4.00	1.0	4.00	48	192.0		19.2	9.6		$20,871
LNG Import and Export Equipment reporters 3,18	4.00	1.0	4.00	6	24.0		2.4	1.2		$2,609
Onshore Petroleum and Natural Gas Production reporters 3,18	4.00	1.0	4.00	204	816.0		81.6	40.8		$88,703
Natural Gas Distribution reporters 3,18	4.00	1.0	4.00	169	676.0		67.6	33.8		$73,485
LNG Storage reporters 3,18	4.00	1.0	4.00	6	24.0		2.4	1.2		$2,609
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 3,18	4.00	1.0	4.00	86	344.0		34.4	17.2		$37,395
Determine emissions using population counts										
Onshore Natural Gas Processing reporters 19,20	0.45	1.0	0.45	0		-				$0
Onshore Natural Gas Transmission Compression reporters 19,20	0.45	1.0	0.45	0		-				$0
Underground Natural Gas Storage reporters 19,20	0.45	1.0	0.45	44		19.8				$1,202
LNG Import and Export Equipment reporters 19,20	0.45	1.0	0.45	6		2.7				$164
Onshore Petroleum and Natural Gas Production reporters 26	4.50	1.0	4.50	464		2,088.0				$126,783
Natural Gas Distribution reporters 19,20	0.45	1.0	0.45	167		75.2				$4,563
LNG Storage reporters 19,20	0.45	1.0	0.45	5		2.3				$137
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 19,20	0.45	1.0	0.45	320		144.0				$8,744
Blowdown Vent Stacks										

Year 1-3	Hours per Occurrence	Occurrences/ Respondent/Year	Hours/ Respondent/ Year	Respondents/ Year	Engineer Hours/Year	Technician Hours/Year	Middle Manager Hours/Year	Senior Manager Hours/Year	Lawyer Hours/Year	Cost/ Year
Calculate emissions										
Onshore Natural Gas Processing reporters 2,79,88	1.00	4.0	4.00	304	1,216.0		121.6	60.8		$132,185
Onshore Natural Gas Transmission Compression reporters 2,79,88	1.00	4.0	4.00	515	2,060.0		206.0	103.0		$223,932
LNG Import and Export Equipment reporters 2, 79, 80	1.00	2.0	2.00	4	8.0		0.8	0.4		$870
Natural Gas Transmission Pipeline reporters 2,79,88	1.00	4.0	4.00	33	132.0		13.2	6.6		$14,349
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 2,79,89	1.00	6.0	6.00	263	1,578.0		157.8	78.9		$171,536
Centrifugal Compressors										
Measure volumetric emissions from centrifugal compressors										
Onshore Natural Gas Processing reporters 94	0.00	0.0	0.00	0	-		-	-		$0
Onshore Natural Gas Transmission Compression reporters 94	0.00	0.0	0.00	0	-		-	-		$0
Underground Natural Gas Storage reporters 94	0.00	0.0	0.00	0	-		-	-		$0
LNG Import and Export Equipment reporters 94	0.00	0.0	0.00	0	-		-	-		$0
LNG Storage reporters 94	0.00	0.0	0.00	0	-		-	-		$0
Calculate facility-wide emission factor and calculate mass emissions										
Onshore Natural Gas Processing reporters 13,21,22	0.17	3.6	0.60	124	74.4		7.4	3.7		$8,088
Onshore Natural Gas Transmission Compression reporters 13,21,23	0.17	2.4	0.40	352	140.8		14.1	7.0		$15,306
Underground Natural Gas Storage reporters 13,21,24	0.17	3.5	0.58	10	5.8		0.6	0.3		$634
LNG Import and Export Equipment reporters 13,21,25	0.17	4.4	0.73	2	1.5		0.1	0.1		$159
LNG Storage reporters 13,21,27	0.17	0.9	0.15	1	0.2		0.0	0.0		$16
Determine count and calculate emissions using emission factor										
Onshore Petroleum and Natural Gas Production reporters 28	0.10	1.0	0.10	13		1.3				$79
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 28	0.10	1.0	0.10	24		2.4				$146

Year 1-3	Hours per Occurrence	Occurrences/ Respondent/Year	Hours/ Respondent/ Year	Respondents/ Year	Engineer Hours/Year	Technician Hours/Year	Middle Manager Hours/Year	Senior Manager Hours/Year	Lawyer Hours/Year	Cost/ Year
Reciprocating Compressors										
Measure volumetric emissions from reciprocating compressors										
Onshore Natural Gas Processing reporters 94	0.00	0.0	0.00	0		-				$0
Onshore Natural Gas Transmission Compression reporters 94	0.00	0.0	0.00	0		-				$0
Underground Natural Gas Storage reporters 94	0.00	0.0	0.00	0		-				$0
LNG Import and Export Equipment reporters 94	0.00	0.0	0.00	0		-				$0
LNG Storage reporters 94	0.00	0.0	0.00	0		-				$0
Calculate facility-wide emission factor and calculate mass emissions										
Onshore Natural Gas Processing reporters 13,21,29	0.17	8.2	1.37	340	464.7		46.5	23.2		$50,512
Onshore Natural Gas Transmission Compression reporters 13,21,30	0.17	6.9	1.15	312	358.8		35.9	17.9		$39,003
Underground Natural Gas Storage reporters 13,21,31	0.17	6.9	1.15	47	54.1		5.4	2.7		$5,876
LNG Import and Export Equipment reporters 13,21,32	0.17	3.9	0.65	4	2.6		0.3	0.1		$283
LNG Storage reporters 13,21,33	0.17	2.9	0.48	2	1.0		0.1	0.0		$105
Determine count and calculate emissions using emission factor										
Onshore Petroleum and Natural Gas Production reporters 28	0.10	1.0	0.10	497		49.7				$3,018
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 28	0.10	1.0	0.10	321		32.1				$1,949
Combustion Emissions										
Determine fuel consumption through company records and calculate emissions										
Onshore Petroleum and Natural Gas Production reporters 2,3,34	2.00	1	2.00	497	994.0		99.4	49.7		$108,053
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 2,3,34	2.00	1	2.00	321	642.0		64.2	32.1		$69,789
Natural Gas Distribution reporters 2,3,35	2.00	1	2.00	169	338.0		33.8	16.9		$36,742
Associated Gas Venting and Flaring										

Year 1-3	Hours per Occurrence	Occurrences/ Respondent/Year	Hours/ Respondent/ Year	Respondents/ Year	Engineer Hours/Year	Technician Hours/Year	Middle Manager Hours/Year	Senior Manager Hours/Year	Lawyer Hours/Year	Cost/ Year
Calculate emissions using GOR and equations in rule										
Onshore Petroleum and Natural Gas Production reporters 3,13,35	5.00	1.0	5.00	150	750.0		75.0	37.5		$81,529
Determine GOR using available information										
Onshore Petroleum and Natural Gas Production reporters 3,36	1.00	0.0	0.00	0	-		-	-		$0
Dehydrators										
Run simulation software, such as AspenTech HYSYS® or GRI-GLYCalc™ (M1)										
Onshore Natural Gas Processing reporters 13,15,37	0.25	0.0	0.00	0	-		-	-		$0
Onshore Petroleum and Natural Gas Production reporters 13,15,37	0.25	0.0	0.00	0	-		-	-		$0
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 13,15,37	0.25	0.0	0.00	0	-		-	-		$0
Gather data for simulation run (M1)										
Onshore Natural Gas Processing reporters 13,15,37	0.17	0.0	0.00	0		-				$0
Onshore Petroleum and Natural Gas Production reporters 13,15,37	0.17	0.0	0.00	0		-				$0
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 13,15,37	0.17	0.0	0.00	0		-				$0
Equipment counts and population emission factors (M2)										
Onshore Natural Gas Processing reporters 13,38	0.17	1.1	0.18	9		1.7				$100
Onshore Petroleum and Natural Gas Production reporters 13,38	0.17	31.3	5.22	148		772.1				$46,880
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 13,38	0.17	4.9	0.81	104		84.5				$5,131
Gathering data (M3)										
Onshore Natural Gas Processing reporters 13,39	0.17	3.1	0.52	123		63.6				$3,859
Onshore Petroleum and Natural Gas Production reporters 13,39	0.17	29.7	4.95	18		89.1				$5,410

Year 1-3	Hours per Occurrence	Occurrences/ Respondent/Year	Hours/ Respondent/ Year	Respondents/ Year	Engineer Hours/Year	Technician Hours/Year	Middle Manager Hours/Year	Senior Manager Hours/Year	Lawyer Hours/Year	Cost/ Year
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 13,39	0.17	5.2	0.87	15		13.0				$789
Calculations using Eq. W-6 (M3)										
Onshore Natural Gas Processing reporters 3,13,39	0.17	3.1	0.52	123	63.6		6.4	3.2		$6,908
Onshore Petroleum and Natural Gas Production reporters 3,13,39	0.17	29.7	4.95	18	89.1		8.9	4.5		$9,686
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 3,13,39	0.17	5.2	0.87	15	13.0		1.3	0.7		$1,413
EOR Hydrocarbon Liquid Dissolved CO_2										
Measure volume of hydrocarbon liquids produced through EOR operations										
Onshore Petroleum and Natural Gas Production reporters 42,43	0.17	3.3	0.55	13		7.2				$434
Determine average CO2 retained in HC liquids downstream of the storage tank										
Onshore Petroleum and Natural Gas Production reporters 42,43	0.17	3.3	0.55	13		7.2				$434
Calculation using Eq. W-38										
Onshore Petroleum and Natural Gas Production reporters 3,42,43	0.17	3.3	0.55	13	7.2		0.7	0.4		$777
EOR Injection Pump Blowdown										
Calculate total injection pump system volume										
Onshore Petroleum and Natural Gas Production reporters 3,13,44	0.17	15.7	2.62	10	26.2		2.6	1.3		$2,844
Retain logs of number of blowdowns per year										
Onshore Petroleum and Natural Gas Production reporters 3,13,44	0.17	15.7	2.62	10	26.2		2.6	1.3		$2,844
Calculate emissions using Eq W-37										
Onshore Petroleum and Natural Gas Production reporters 3,13,44	0.17	15.7	2.62	10	26.2		2.6	1.3		$2,844

Year 1-3	Hours per Occurrence	Occurrences/ Respondent/Year	Hours/ Respondent/ Year	Respondents/ Year	Engineer Hours/Year	Technician Hours/Year	Middle Manager Hours/Year	Senior Manager Hours/Year	Lawyer Hours/Year	Cost/ Year
Transmission Tanks at Onshore Natural Gas Transmission Compression reporters										
Screen for leaks using optical gas imaging instrument 3,13,42,46	0.17	1.5	0.24	410	100.3		10.0	5.0		$10,907
Screen for leaks using acoustic leak detection device 3,13,42,46	0.17	1.5	0.24	10	2.4		0.2	0.1		$266
Screen and quantify leaks using calibrated bag 3,13,41,46	0.25	0.0	0.00	0	-		-	-		$0
Screen and quantify leaks using flow meter 3,13,42,46	0.17	1.5	0.25	0	-		-	-		$0
Screen and quantify leaks using high volume sampler 3,13,41,46	0.25	1.5	0.37	22	8.1		0.8	0.4		$878
Quantify leaks using high volume sampler after screening with optical gas imaging instrument or acoustic leak detection device 3,13,42,55	0.25	1.5	0.37	99	36.3		3.6	1.8		$3,950
Quantify leaks using flowmeter after screening with optical gas imaging instrument or acoustic leak detection device 3,13,41,56	0.25	1.5	0.37	33	12.1		1.2	0.6		$1,317
Screen for leaks using optical gas imaging instrument 3,13,42,46	0.17	1.5	0.24	410	100.3		10.0	5.0		$10,907
Pneumatic Devices										
Estimate count of high bleed, low bleed, and intermittent bleed devices and apply population factor (available only in the first two reporting years for new reporters)										
Onshore Petroleum and Natural Gas Production new reporters 3,49,50,82	0.00	0.0	0.00	0	-		-	-		$0
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 3,49,50,82	0.00	0.0	0.00	0	-		-	-		$0
Perform inventory of high bleed, low bleed, and intermittent bleed devices and apply population factor										
Onshore Natural Gas Transmission Compression reporters 3,20,51,52	0.45	1.0	0.45	530	238.5		23.9	11.9		$25,926
Underground Natural Gas Storage reporters 3,20,51,52	0.45	1.0	0.45	48	21.6		2.2	1.1		$2,348

Year 1-3	Hours per Occurrence	Occurrences/ Respondent/Year	Hours/ Respondent/ Year	Respondents/ Year	Engineer Hours/Year	Technician Hours/Year	Middle Manager Hours/Year	Senior Manager Hours/Year	Lawyer Hours/Year	Cost/ Year
Onshore Petroleum and Natural Gas Production reporters 3,20,51,52	0.45	1.0	0.45	497	223.7		22.4	11.2		$24,312
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 3,51,83	0.45	1.0	0.45	321	144.5		14.4	7.2		$15,702
Storage Tanks										
Determine emissions by calculating flashing emissions with software program, such as AspenTech HYSYS® or API 4697 E&P Tank (M1)										
Onshore Petroleum and Natural Gas Production reporters 3,15,53	0.50	394.1	197.05	266	52,415.3		5,241.5	2,620.8		$5,697,805
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 3,13,53	0.50	77.9	38.95	145	5,648.0		564.8	282.4		$613,966
Determine emissions by sampling and analyzing separator oil composition (M2)										
Onshore Petroleum and Natural Gas Production reporters 13,15	0.02	90.0	1.50	90		135.0				$8,197
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 13,15	0.02	280.0	4.67	42		196.0				$11,901
Determine emissions using equipment counts and population emission factors (M3)										
Onshore Petroleum and Natural Gas Production reporters 13,15	0.01	417.9	3.48	394		1,372.1				$83,314
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 13,15	0.01	53.3	0.44	189		84.0				$5,100
Pneumatic Pumps										
Perform inventory of pneumatic pumps and apply population factor										
Onshore Petroleum and Natural Gas Production reporters 3,20,51	0.45	1.0	0.45	316	142.2		14.2	7.1		$15,458
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 3,20,51	0.45	1.0	0.45	219	98.6		9.9	4.9		$10,713
Well Testing										
Determine GOR										

Year 1-3	Hours per Occurrence	Occurrences/ Respondent/Year	Hours/ Respondent/ Year	Respondents/ Year	Engineer Hours/Year	Technician Hours/Year	Middle Manager Hours/Year	Senior Manager Hours/Year	Lawyer Hours/Year	Cost/ Year
Onshore Petroleum and Natural Gas Production reporters 3,13,58,59	0.17	0.0	0.00	0	-		-	-		$0
Determine production rate										
Onshore Petroleum and Natural Gas Production reporters 3,13,58,60	0.17	0.0	0.00	0	-		-	-		$0
Calculate emissions using Eq W-17A or W-17B										
Onshore Petroleum and Natural Gas Production reporters 3,13,58	0.17	799.6	133.27	10	1,332.7		133.3	66.6		$144,868
Well Venting for Liquids Unloading										
Measure flow rate (M1)										
Onshore Petroleum and Natural Gas Production reporters 3,13,15,47	0.08	0.0	0.00	0	-		-	-		$0
Calculate emissions (M1)										
Onshore Petroleum and Natural Gas Production reporters 3,13,15,47	0.17	0.0	0.00	0	-		-	-		$0
Determine well counts, number of events, well depth, calculate pressure, calculate flow (M2 and M3)										
Onshore Petroleum and Natural Gas Production reporters 3,58	0.17	174.3	29.05	200	5,810.0		581.0	290.5		$631,576
Gas Well Completions and Workovers										
Measure flowback from Completions and Workovers with Hydraulic Fracturing (M1)										
Onshore Petroleum and Natural Gas Production reporters 3,13,15,47	8.00	0.0	0.00	0	-		-	-		$0
Calculate emissions from Completions and Workovers with Hydraulic Fracturing (M2)										
Onshore Petroleum and Natural Gas Production reporters 3,13,42	0.17	24.9	4.15	163	676.5		67.6	33.8		$73,533
Determine number of workovers and completions to estimate emissions from Completions and Workovers without Hydraulic Fracturing										

Year 1-3	Hours per Occurrence	Occurrences/ Respondent/Year	Hours/ Respondent/ Year	Respondents/ Year	Engineer Hours/Year	Technician Hours/Year	Middle Manager Hours/Year	Senior Manager Hours/Year	Lawyer Hours/Year	Cost/ Year
Onshore Petroleum and Natural Gas Production reporters 3,13,15	0.17	24.9	4.15	181	751.2		75.1	37.6		$81,654
Oil Well Completions and Workovers										
Measure flowback from Completions and Workovers with Hydraulic Fracturing and determine emissions										
Onshore Petroleum and Natural Gas Production reporters 3,62,64	24.00	6.0	144.00	144	20,736.0		2,073.6	1,036.8		$2,254,107
Flare Stacks										
Determine volume of gas sent to the flare; determine fraction of the feed gas sent to an un-lit flare; determine flare combustion efficiency; and determine feed gas composition										
Onshore Natural Gas Processing reporters 3,13,65	0.33	2.0	0.67	364	242.7		24.3	12.1		$26,379
Onshore Natural Gas Transmission Compression reporters 3,13,65	0.33	1.2	0.40	17	6.8		0.7	0.3		$739
Underground Natural Gas Storage reporters 3,13,65	0.33	2.5	0.83	8	6.7		0.7	0.3		$725
LNG Import and Export Equipment reporters 3,13,65	0.33	3.0	1.00	4	4.0		0.4	0.2		$435
Onshore Petroleum and Natural Gas Production reporters 3,13,65	0.33	88.7	29.57	355	10,496.2		1,049.6	524.8		$1,140,986
LNG Storage reporters 3,13,65	0.33	1.0	0.33	1	0.3		0.0	0.0		$36
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 3,13, 65	0.33	18.9	6.30	221	1,391.3		139.1	69.6		$151,245
Calculate emissions										
Onshore Natural Gas Processing reporters 3,13,15	0.17	2.0	0.33	364	121.3		12.1	6.1		$13,190
Onshore Natural Gas Transmission Compression reporters 3,13,15	0.17	1.2	0.20	17	3.4		0.3	0.2		$370
Underground Natural Gas Storage reporters 3,13,15	0.17	2.5	0.42	8	3.3		0.3	0.2		$362
LNG Import and Export Equipment reporters 3,13,15	0.17	3.0	0.50	4	2.0		0.2	0.1		$217

Year 1-3	Hours per Occurrence	Occurrences/ Respondent/Year	Hours/ Respondent/ Year	Respondents/ Year	Engineer Hours/Year	Technician Hours/Year	Middle Manager Hours/Year	Senior Manager Hours/Year	Lawyer Hours/Year	Cost/ Year
Onshore Petroleum and Natural Gas Production reporters 3,13,15	0.17	88.7	14.78	355	5,248.1		524.8	262.4		$570,493
LNG Storage reporters 3,13,15	0.17	1.0	0.17	1	0.2		0.0	0.0		$18
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 3,13,15	0.17	18.9	3.15	221	695.7		69.6	34.8		$75,622
C. Create Information (Included in 4B)										
D. Gather Existing Information (Included in 4E)										
E. Write Report										
Onshore Natural Gas Processing reporters 67	26.00	1.0	26.00	449	11,674.0	898.0		-		$1,212,462
Onshore Natural Gas Transmission Compression reporters 67	26.00	1.0	26.00	532	13,832.0	1,064.0		-		$1,436,592
Underground Natural Gas Storage reporters 67	26.00	1.0	26.00	48	1,248.0	96.0		-		$129,617
LNG Import and Export Equipment reporters 67	26.00	1.0	26.00	6	156.0	12.0		-		$16,202
Onshore Petroleum and Natural Gas Production reporters 67	26.00	1.0	26.00	497	12,922.0	994.0		-		$1,342,079
Natural Gas Distribution reporters 67	26.00	1.0	26.00	169	4,394.0	338.0		-		$456,361
LNG Storage reporters 67	26.00	1.0	26.00	6	156.0	12.0		-		$16,202
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 67	26.00	1.0	26.00	321	8,346.0	642.0		-		$866,816
Natural Gas Transmission Pipeline reporters 67	26.00	1.0	26.00	33	858.0	66.0		-		$89,112
Offshore Petroleum and Natural Gas Production reporters 103	13.00	1.0	13.00	141	1,833.0	141.0		-		$190,375
5. RECORDKEEPING REQUIREMENTS										
A. Read Instructions (Included in 4A)										
B. Plan Activities (Included in 4B)										
C. Implement Activities (Included in 4B)										
D. Recordkeeping										
Onshore Natural Gas Processing reporters 68	13.00	1.0	13.00	449	5,837.0	449.0		-		$606,231
Onshore Natural Gas Transmission Compression reporters 68	13.00	1.0	13.00	532	6,916.0	532.0		-		$718,296

Year 1-3	Hours per Occurrence	Occurrences/ Respondent/Year	Hours/ Respondent/ Year	Respondents/ Year	Engineer Hours/Year	Technician Hours/Year	Middle Manager Hours/Year	Senior Manager Hours/Year	Lawyer Hours/Year	Cost/ Year
Underground Natural Gas Storage reporters 68	13.00	1.0	13.00	48	624.0	48.0	48.0	-		$64,809
LNG Import and Export Equipment reporters 68	13.00	1.0	13.00	6	78.0	6.0	6.0	-		$8,101
Onshore Petroleum and Natural Gas Production reporters 68	13.00	1.0	13.00	497	6,461.0	497.0	497.0	-		$671,039
Natural Gas Distribution reporters 68	13.00	1.0	13.00	169	2,197.0	169.0	169.0	-		$228,180
LNG Storage reporters 68	13.00	1.0	13.00	6	78.0	6.0	6.0	-		$8,101
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 68	13.00	1.0	13.00	321	4,173.0	321.0	321.0	-		$433,408
Natural Gas Transmission Pipeline reporters 68	13.00	1.0	13.00	33	429.0	33.0	33.0	-		$44,556
Offshore Petroleum and Natural Gas Production reporters 103	6.50	1.0	6.50	141	916.5	141.0	141.0	-		$106,919
E. Time to Transmit or Disclose Information (included in 4E)										
F. Time to Train Personnel (included in 4A)										
G. Time for Audits (Not Applicable)										
TOTAL ANNUAL LABOR BURDEN AND COST		141.0			226,572.5	11,707.7	20,809.4	7,172.2	4,404.0	$25,051,135
								270,665.8		
ANNUAL COSTS (O&M) 84										
Recordkeeping costs										
Onshore Natural Gas Processing reporters 85		1.0		449						$22,450
Onshore Natural Gas Transmission Compression reporters 85		1.0		532						$26,600
Underground Natural Gas Storage reporters 85		1.0		48						$2,400
LNG Import and Export Equipment reporters 85		1.0		6						$300
Onshore Petroleum and Natural Gas Production reporters 85		1.0		497						$24,850
Natural Gas Distribution reporters 85		1.0		169						$8,450
LNG Storage reporters 85		1.0		6						$300
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 85		1.0		321						$16,050
Natural Gas Transmission Pipeline reporters 85		1.0		33						$1,650

Year 1-3	Hours per Occurrence	Occurrences/ Respondent/Year	Hours/ Respondent/ Year	Respondents/ Year	Engineer Hours/Year	Technician Hours/Year	Middle Manager Hours/Year	Senior Manager Hours/Year	Lawyer Hours/Year	Cost/ Year
Offshore Petroleum and Natural Gas Production reporters 85		1.0		141						$7,050
Acid gas removal units										
Quarterly gas samples and analyses										
Onshore Natural Gas Processing reporters 13,69		5.6		61						$136,640
Onshore Petroleum and Natural Gas Production reporters 69,81		0.0		0						$0
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 69,81		0.0		0						$0
Acid gas removal units										
Simulation software yearly cost										
Onshore Natural Gas Processing reporters 70,71		1.0		76						$50,667
Onshore Petroleum and Natural Gas Production reporters 70,71		1.0		6						$4,000
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 70,71		1.0		21						$14,000
Centrifugal and Reciprocating Compressors--contractor to perform compressor leak measurements										
Onshore Natural Gas Processing reporters 92,93		6.0		340						$1,218,309
Onshore Natural Gas Transmission Compression reporters 92,93		6.0		352						$1,261,309
Underground Natural Gas Storage reporters 92,93		6.0		47						$168,413
LNG Import and Export Equipment reporters 92,93		6.0		4						$14,333
LNG Storage reporters 92,93		6.0		2						$7,167
Transmission storage tanks--flow meter										
Onshore Natural Gas Transmission Compression reporters 13,77,93		1.5		33						$18,080
Transmission storage tanks--acoustic leak detection device										
Onshore Natural Gas Transmission Compression reporters 13,77,93		1.5		10						$15
Transmission storage tanks--optical gas imaging instrument										
Onshore Natural Gas Transmission Compression reporters 13,77,93		1.5		410						$224,626

Year 1-3	Hours per Occurrence	Occurrences/ Respondent/Year	Hours/ Respondent/ Year	Respondents/ Year	Engineer Hours/Year	Technician Hours/Year	Middle Manager Hours/Year	Senior Manager Hours/Year	Lawyer Hours/Year	Cost/ Year
Transmission storage tanks--high volume sampler										
Onshore Natural Gas Transmission Compression reporters 13,77,93		1.5		121						$66,292
Transmission storage tanks--calibrated bag										
Onshore Natural Gas Transmission Compression reporters 63		1.5		0						$0
Storage tanks										
Simulation software yearly cost										
Onshore Petroleum and Natural Gas Production reporters 70,87		1.0		266						$53,200
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 70,87		1.0		145						$29,000
Flare stacks										
Simulation software yearly cost										
Onshore Petroleum and Natural Gas Production reporters 70,87		1.0		266						$53,200
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 70,87		1.0		145						$29,000
Glycol Dehydrators >= 0.4 million standard cubic feet per day										
Feed gas sampling analysis										
Onshore Natural Gas Processing reporters 37,66		0.0		0						$0
Onshore Petroleum and Natural Gas Production reporters 37,66		0.0		0						$0
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 37,66		0.0		0						$0
Feed gas water content										
Onshore Natural Gas Processing reporters 37,86		0.0		0						$0
Onshore Petroleum and Natural Gas Production reporters 37		0.0		0						$0
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 37		0.0		0						$0
Dry gas water content										
Onshore Natural Gas Processing reporters 40,86		0.0		0						$0

Year 1-3	Hours per Occurrence	Occurrences/ Respondent/Year	Hours/ Respondent/ Year	Respondents/ Year	Engineer Hours/Year	Technician Hours/Year	Middle Manager Hours/Year	Senior Manager Hours/Year	Lawyer Hours/Year	Cost/ Year
Onshore Petroleum and Natural Gas Production reporters 40,86		0.0		0						$0
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 40,86		0.0		0						$0
Equipment Leak Surveys--Method 21 Testing										
Onshore Natural Gas Processing reporters 73, 95		5,951.0		449						$8,176,317
Onshore Natural Gas Transmission Compression reporters 73, 96		3,839.0		532						$6,249,585
Underground Natural Gas Storage reporters 73, 97		7,864.0		48						$1,155,064
LNG Import and Export Equipment reporters 73, 98		5,600.0		6						$102,816
Onshore Petroleum and Natural Gas Production reporters 72,73		0.0		0						$0
Natural Gas Distribution reporters 73, 99		2,080.0		169						$1,075,651
LNG Storage reporters 73, 100		1,400.0		6						$25,704
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 72,73		0.0		0						$0
Onshore Natural Gas Processing reporters 73, 95		5,951.0		449						$8,176,317
ANNUALIZED CAPITAL COSTS										
Blowdown vent stacks--flow meter										
Onshore Natural Gas Processing reporters 74		0.0		0						$0
Onshore Natural Gas Transmission Compression reporters 74		0.0		0						$0
LNG Import and Export Equipment reporters 74		0.0		0						$0
Natural Gas Transmission Pipeline reporters 74		0.0		0						$0
Onshore Petroleum and Natural Gas Gathering and Boosting reporters 74		0.0		0						$0
Centrifugal and Reciprocating Compressors--flow meter										
Onshore Natural Gas Processing reporters 94		1.0		0						$0
Onshore Natural Gas Transmission Compression reporters 94		1.0		0						$0
Underground Natural Gas Storage reporters 94		1.0		0						$0

Year 1-3	Hours per Occurrence	Occurrences/ Respondent/Year	Hours/ Respondent/ Year	Respondents/ Year	Engineer Hours/Year	Technician Hours/Year	Middle Manager Hours/Year	Senior Manager Hours/Year	Lawyer Hours/Year	Cost/ Year
LNG Import and Export Equipment reporters 94		1.0		0						$0
LNG Storage reporters 94		1.0		0						$0
Equipment Leak surveys--acoustic leak detection device										
Onshore Natural Gas Processing reporters 46		0.0		0						$0
Onshore Natural Gas Transmission Compression reporters 46		0.0		0						$0
Underground Natural Gas Storage reporters 46		0.0		0						$0
LNG Import and Export Equipment reporters 46		0.0		0						$0
Natural Gas Distribution reporters 46		0.0		0						$0
LNG Storage reporters 46		0.0		0						$0
Equipment Leak surveys--infrared laser beam illuminated instrument										
Onshore Natural Gas Processing reporters 46		0.0		0						$0
Onshore Natural Gas Transmission Compression reporters 46		0.0		0						$0
Underground Natural Gas Storage reporters 46		0.0		0						$0
LNG Import and Export Equipment reporters 46		0.0		0						$0
Natural Gas Distribution reporters 46		0.0		0						$0
LNG Storage reporters 46		0.0		0						$0
Equipment Leak surveys--optical gas imaging instrument										
Onshore Natural Gas Processing reporters 57		0.0		0						$0
Onshore Natural Gas Transmission Compression reporters 46		0.0		0						$0
Underground Natural Gas Storage reporters 46		0.0		0						$0
LNG Import and Export Equipment reporters 46		0.0		0						$0
Natural Gas Distribution reporters 46		0.0		0						$0
LNG Storage reporters 46		0.0		0						$0
Transmission storage tanks--flow meter										
Onshore Natural Gas Transmission Compression reporters 75		1.0		0						$0

Year 1-3	Hours per Occurrence	Occurrences/ Respondent/Year	Hours/ Respondent/ Year	Respondents/ Year	Engineer Hours/Year	Technician Hours/Year	Middle Manager Hours/Year	Senior Manager Hours/Year	Lawyer Hours/Year	Cost/ Year
Transmission storage tanks--acoustic leak detection device										
Onshore Natural Gas Transmission Compression reporters 46		0.0		0						$0
Transmission storage tanks--optical gas imaging instrument										
Onshore Natural Gas Transmission Compression reporters 46		0.0		0						$0
Transmission storage tanks--high volume sampler										
Onshore Natural Gas Transmission Compression reporters 46		0.0		0						$0
Transmission storage tanks--calibrated bag										
Onshore Natural Gas Transmission Compression reporters 46		0.0		0						$0
Gas well completions and workovers with hydraulic fracturing--flow meter										
Onshore Petroleum and Natural Gas Production reporters 46		0.0		0						$0
Oil well completions and workovers with hydraulic fracturing--flow meter										
Onshore Petroleum and Natural Gas Production reporters 76, 102,104		0.0		0						$0
Well venting for liquids unloading--flow meter										
Onshore Petroleum and Natural Gas Production reporters 46		0.0		0						$0

Appendix E-2. Summarized Burden and Cost for Petroleum and Natural Gas Systems (Subpart W)—Years 1 - 3

COST TYPE	TOTAL BURDEN (HRS)	TOTAL COST
Total Annualized Capital Cost	----------	$0
Total Annual Labor Cost	270,665.8	$25,051,135
Total Annual O&M Costs	----------	$20,161,288
Total Annual Costs (Labor, O&M, And Annualized Capital)	270,665.8	$45,212,423

Appendix E-3. Footnotes Applicable to Appendix E-1

1 Assumed 5 hours per reporter per year to read rule.
2 Assumed activity occurs once per year per reporter.
3 For each hour of an Engineer's time, assumed 0.1 hours of a Middle Manager's time and 0.05 hours of a Senior Manager's time for oversight and review.
4 Assumed one hour of a company lawyer's time for questions about applicability, overlap in existing reporting programs, etc., while reviewing Part 98 language each year.
5 Assumed lower LOE for Offshore segment because rule only asks for information already being gathered under other programs.
6 Assumed 5 hours per reporter per year to read Subpart A of Part 98.
7 Assumed 1 hour per year to gather CEMS data.
8 Most of the costs used in this analysis assume that reporters will choose to use the least cost option. Although the use of CEMS is not the least cost option, reporters already using CEMS are required to comply using CEMS for acid gas removal units.
9 [Reserved]
10 Although this is not the least cost option, reporters with CEMS are required to comply using CEMS for acid gas removal units.
11 [Reserved]
12 Assumed sampling was equal to calculation (10 minutes per unit) and multiplied by 4 for quarterly activities.
13 Number of occurrences per respondent based on average number reported by segment for RY2017.
14 Although this is not the least cost option, reporters with flow meters are required to comply using existing flow meters for acid gas removal units.
15 LOE from December 2010 EIA.
16 [Reserved]
17 [Reserved]
18 Assumed 4 hours per year per respondent to schedule contractor, review contractor results, etc.
19 Assumed 4.5 hours in first year. Assumed 10% of 4.5 hours in subsequent years. After the first year, the LOE will only involve accounting for changes from the previous year.
20 Assumed that updating the inventory each year would not include counting each piece of equipment but more of an accounting exercise where records show how many devices are no longer in service during the reporting year and how many new devices were installed during the reporting year.
21 Assumed 10 minutes per compressor for calculating emissions.
22 There is burden reduction of one vent reading if vents are manifolded; assuming that 10% of vents are manifolded and 90% are not manifolded, the number of occurrences is reduced from 3.7 to 3.6 (0.9*3.7+0.1*(3.7-1)=3.6).
23 There is burden reduction of one vent reading if vents are manifolded; assuming that 10% of vents are manifolded and 90% are not manifolded, the number of occurrences is reduced from 2.5 to 2.4 (0.9*2.5+0.1*(2.5-1)=2.4).
24 There is burden reduction of one vent reading if vents are manifolded; assuming that 10% of vents are manifolded and 90% are not manifolded, the number of occurrences is reduced from 3.6 to 3.5 (0.9*3.6+0.1*(3.6-1)=3.5).
25 There is burden reduction of one vent reading if vents are manifolded; assuming that 10% of vents are manifolded and 90% are not manifolded, the number of occurrences is reduced from 4.5 to 4.4 (0.9*4.5+0.1*(4.5-1)=4.4).
26 Assumed 4.5 hours in all years for Onshore Production. This industry segment has a much larger number of components to inventory than other industry segments.

27 There is burden reduction of one vent reading if vents are manifolded; assuming that 10% of vents are manifolded and 90% are not manifolded, the number of occurrences is reduced from 1.0 to 0.9 (0.9*1.0+0.1*(1.0-1)=0.9).
28 Assumed 1.0 hours per reporter in first year. Assumed 10% of 1.0 hours in subsequent years. After the first year, the LOE will only involve accounting for changes from the previous year.
29 There is burden reduction of one vent reading if vents are manifolded; assuming that 10% of vents are manifolded and 90% are not manifolded, the number of occurrences is reduced from 8.3 to 8.2 (0.9*8.3+0.1*(8.3-1)=8.2).
30 There is burden reduction of one vent reading if vents are manifolded; assuming that 10% of vents are manifolded and 90% are not manifolded, the number of occurrences is reduced from 7.0 to 6.9 (0.9*7.0+0.1*(7.0-1)=6.9).
31 There is burden reduction of one vent reading if vents are manifolded; assuming that 10% of vents are manifolded and 90% are not manifolded, the number of occurrences is reduced from 7.0 to 6.9 (0.9*7.0+0.1*(7.0-1)=6.7).
32 There is burden reduction of one vent reading if vents are manifolded; assuming that 10% of vents are manifolded and 90% are not manifolded, the number of occurrences is reduced from 4.0 to 3.9 (0.9*4.0+.1*(4.0-1)=3.9).
33 There is burden reduction of one vent reading if vents are manifolded; assuming that 10% of vents are manifolded and 90% are not manifolded, the number of occurrences is reduced from 3.0 to 2.9 (0.9*3.0+0.1*(3.0-1)=2.9).
34 Assumed 2 hours per year to combine company records and calculate emissions.
35 Assumed 5 hours per year per reporter to calculate emissions using GOR and equations in the rule.
36 Assumed industry already determines GOR as part of standard business practices.
37 Running simulation software, such as GlyCALC is required by glycolic dehydrators subject to 40 CFR Part 63 Subpart HH, so no costs were assumed to be attributable to the GHGRP.
38 Assumed 10 minutes per reporter per year.
39 Assumed 10 minutes per dehydrator per year.
40 No reporters used this option in RY2017.
41 Assumed 15 minutes per tank.
42 Assumed 10 minutes per tank.
43 Number of occurrences per reporter based on average number of tanks reported per segment for RY2017.
44 Assumed 10 minutes per blowdown per year.
45 [Reserved]
46 Based on RY2017 data, 442 unique facilities tested for leaks from transmission tanks. Of those 442 facilities, 410 used optical gas imaging to screen for leaks, 10 used acoustic leak detection to screen for leaks, and 22 used high volume sampling for screening and quantifying leaks. No facilities used calibrated bags or flow meters to screen and quantify leaks.
47 Assumed that this is not the least cost option available.
48 [Reserved]
49 Assumed 0.45 hours per reporter in first two years to estimate the count of pneumatic devices.
50 This option is only available to reporters during the first two years of reporting under subpart W.
51 To perform the inventory, assumed 4.5 hours in first year and assumed 10% of 4.5 hours in subsequent years. After the first year, the LOE will only involve accounting for changes from the previous year.
52 Assumed that all existing reporters are required to perform the inventory.

53 Number of occurrences per reporter based on average number of hydrocarbon liquid tanks per reporter reported by segment for RY2017.
54 [Reserved]
55 Based on RY2017 data, 154 facilities discovered transmission tank leaks using optical gas imaging, acoustic leak detection, or high volume sampling. Of those, 99 facilities quantified those leaks using high volume sampling, 33 facilities quantified the leaks using flowmeters, and 22 used the results of the initial high volume sampling (from footnote 46).
56 [Reserved]
57 This is the sum of reporters using high volume samplers to quantify leaks and reporters using flowmeters to quantify leaks.
58 Assumed 10 minutes per well.
59 [Reserved]
60 Assumed industry already determines production rate as part of standard business practices.
61 [Reserved]
62 Assuming 24 hours to conduct the measurements needed for hydraulically fractured oil wells.
63 Negligible number of reporters used calibrated bags in RY2017 so no costs were calculated.
64 Instead of taking a measurement for each oil well, assumed that each reporter will elect to take "representative" measurements from each oil well type combination and apply to all wells (up to 25 completions and workovers) using Equation W-10A. The well type combinations are sub-basin ID; completion/workover; flared/vented; vertical/horizontal well type; and REC/no REC. The most well type combinations per reporter is 31 and the average is 3.82 per year, according to RY2017 data. To account for anticipated increased activity in the oil fields over the 3 years of this ICR, assumed that a typical facility has 6 well type combinations.
65 Assumed 20 minutes to determine flare stack information.
66 Assumed one time cost for GlyCALC of $300 (or $100 per year over the three years of the ICR).
67 Assumed 30 hours per reporter per year to submit report through e-GGRT (except Offshore Production) to be consistent with High Bin designation for 2019 ICR Renewal (26 hours of an Engineer's time, 2 hours of a Middle Manager's time and 2 hours of a Technician's time).
68 Assumed 15 hours per reporter per year for recordkeeping (except Offshore Production) to be consistent with High Bin designation for 2019 ICR Renewal (13 hours of an Engineer's time, 1 hour of a Middle Manager's time and 1 hour of a Technician's time).
69 Assumed testing cost of $400 per unit.
70 Assumed activity occurs once per year per reporter for simulation software related to acid gas removal units and storage tanks.
71 Assumed one time costs of Aspen HYSYS of $2,000 or $666.67 per year over the three years of the ICR.
72 There is no burden assumed for the onshore petroleum and natural gas production segment or the onshore natural gas gathering and boosting segment. These segments are only required to report the results of surveys performed to comply with other state, federal or voluntary programs. The GHGRP does not require the use of equipment leak surveys for these segments.
73 Assumed Method 21 cost of $3.06 per piece of equipment (see Docket ID No. EPA-HQ-OAR-2006-0699-0089; adjusted the $2.50 2006$ TO $3.06 2017$).
74 Assumed that blowdown vent emissions will be calculated by equipment or event type using 98.233(u) and 98.233(v) instead of using flow meters. Therefore, there are no annualized capital costs for flowmeters with regard to blowdown stacks.
75 Assumed that reporters would hire a contractor to do measurements once per year.
76 Assumed capital cost of $6,066 for flow meter; annualized cost of $863.66 over a period of 10 year equipment life. Need reference from subpart FF costs.
77 Divided cost provided by GPA by 1.6 to convert cost of $597 per measurement to $373 per tank. The 1.6 factor refers to GPA's statement that 40% were measured in not-operating-depressurized (NOD) mode (1 measurement) and the other 60% would be measured in operating mode (2 measurements; one for

rod packing and 1 blowdown valve).
78 Assumed that the number of reporters in RY2017 will be the number of reporters in the three years of this ICR. I cannot guess the number of facilities that will off-ramp in future years so I assume that growth and off ramping will essentially cancel each other out over the three years of this ICR.
79 Assumed that each facility would calculate by equipment or event type using 98.233(u) and 98.233(v).
80 Assumed 2 hours per year per reporter to calculate emissions.
81 No reporters in this industry segment used this compliance option in RY2017.
82 Assumed this option was used prior to RY2016. No new reporters are expected for the three years of this ICR so there will be no costs to estimate counts.
83 Assumed this option was used for the first time in RY2016 so all costs for this ICR renewal are considered subsequent years of 0.45 hours per reporter.
84 Annual operation and maintenance (O&M) includes testing and annual equipment costs, where applicable.
85 Assumed $50 capital costs per reporter for recordkeeping, which includes the cost of file cabinets, hard drives, and cloud file storage for the GHGRP records required to be maintained.
86 Assumed testing cost of $25 per sample.
87 Assumed one time license costs of E&P Tanks of $600 over the three year period or $200 per year.
88 Assumed 4 hours per year per reporter to calculate emissions.
89 Assumed 6 hours per year per reporter to calculate emissions.
90 Assumed same amount of time as for M2 data logging and calculation (10 minutes per AGR).
91 Assumed same amount of time as for dehydrators [10 minutes to compile data + 15 minutes to run simulation, per AGR].
92 Assumed an average of 6 compressors per reporter (based on average number of both types of compressors from RY2017).
93 Based on comment letter received from the Gas Processors Association (EPA-HQ-OAR-2011-0512-0089) dated April 24, 2014. Cost of $597 per compressor are based on 2013$. Costs were escalated to 2017$ using the Chemical Engineering Plant Cost Index to scale the 2013$ to 2017$. The 2017 CEPCI value is 567.5 and the CEPCI value for 2013 was 567.3. Cost in 2017$ = Cost in 2013$ * CEPCI in 2017 / CEPCI in 2013 = 597*567.5/567.3 = $597.21.
94 Assumed that a contractor would be hired to measure compressor leaks/vents so costs are included in O&M instead of labor.
95 It is anticipated that each onshore natural gas processing facility will have to perform equipment leak surveys of all components to comply with the GHGRP. The number of occurrences per year is the average component count for a gas processing plant as presented in Table 4-13 of Volume 8 of the GRI / EPA study.
96 It is anticipated that each onshore natural gas transmission facility will have to perform equipment leak surveys of all components to comply with the GHGRP. The number of occurrences per year is the average component count for a gas processing plant as presented in Table 4-16 of Volume 8 of the GRI / EPA study.
97 It is anticipated that each underground natural gas storage facility will have to perform equipment leak surveys of all station components to comply with the GHGRP. The number of occurrences per year is the average component count for a gas processing plant as presented in Table 4-23 of Volume 8 of the GRI / EPA study.
98 Over the period of RY 2015 through RY 2017, reporters to the LNG Import and Export industry segment of subpart W have reported a facility average of 39 leaking components. Using the facility average reported equipment leaks and an assumed leak rate of 0.69%, an average facility component count was calculated to be 5,600. The leak rate was calculated using a group of onshore production facilities that reported using population counts methods in RY 2016 and fully transitioned to reporting via equipment leak survey method in RY 2017 by dividing the number of leakers found in RY 2017 by the total number of components reported in RY 2016.
99 Over the period of RY 2015 through RY 2017, reporters to the Natural Gas Distribution industry segment of subpart W have reported a facility average of 14 leaking components. Using the facility average reported equipment leaks and an assumed leak rate of 0.69%, an average facility component count was

calculated to be 2,080. The leak rate was calculated using a group of onshore production facilities that reported using population counts methods in RY 2016 and fully transitioned to reporting via equipment leak survey method in RY 2017 by dividing the number of leakers found in RY 2017 by the total number of components reported in RY 2016.
100 Over the period of RY 2015 through RY 2017, reporters to the LNG Storage industry segment of subpart W have reported a facility average of 10 leaking components. Using the facility average reported equipment leaks and an assumed leak rate of 0.69%, an average facility component count was calculated to be 1,400. The leak rate was calculated using a group of onshore production facilities that reported using population counts methods in RY 2016 and fully transitioned to reporting via equipment leak survey method in RY 2017 by dividing the number of leakers found in RY 2017 by the total number of components reported in RY 2016.
101 Assumed each facility has a continuous composition analyzer or is periodically testing for composition of produced gas; no flare stack-specific O&M costs are required.
102 Assumed one portable flow meter per reporter rather than one flow meter per vent stack.
103 Even though Offshore Production reports information that is already required through other programs, there will still be some time needed to separate the Subpart W specific data from the data reported to other programs and to aggregate any necessary information. It is expected that the Offshore Production industry segment will use one half of the time required by other industry segments for reporting and recordkeeping. Reporting is 13 hours of an Engineer's time, 1 hour of a Middle Manager's time and 1 hour of a Technician's time. Recordkeeping is 7.5 hours of an Engineer's time, 0.5 hours of a Middle Manager's time and 0.5 hours of a Technician's time.
104 New tax law (Tax Cuts and Jobs Act, Pub. L. No. 115–97 (2017)), makes it beneficial for Subpart W reporters to pay off any remaining annualized capital expenditures prior to RY2019. Therefore the capital and annualized costs of flow meters are expected to be zero for RY2019 through RY2021.

Appendix E-4. Burden and Costs for Petroleum and Natural Gas Systems (Subpart W) –by Industry Segment for Years 1 – 3

Industry Segments	No. Respondents	Total Burden (hrs)	Total Labor Cost ($)	Capital Cost ($)	O&M Cost ($)	Total Cost ($)
Onshore Natural Gas Processing reporters	449	31,066	$2,859,045	$0	$9,604,383	$12,463,428
Onshore Natural Gas Transmission Compression reporters	532	37,025	$3,410,626	$0	$7,846,506	$11,257,132
Underground Natural Gas Storage reporters	48	3,154	$289,397	$0	$1,325,878	$1,615,274
LNG Import and Export Equipment reporters	6	402	$36,909	$0	$117,449	$154,358
Onshore Petroleum and Natural Gas Production reporters	497	149,257	$13,872,494	$0	$82,050	$13,954,544
Natural Gas Distribution reporters	169	11,128	$1,020,976	$0	$1,084,101	$2,105,078
LNG Storage reporters	6	383	$35,094	$0	$33,171	$68,264
Onshore Petroleum and Natural Gas Gathering and Boosting reporters	321	31,600	$2,914,390	$0	$59,050	$2,973,440
Natural Gas Transmission Pipeline reporters	33	2,082	$191,297	$0	$1,650	$192,947
Offshore Petroleum and Natural Gas Production reporters	141	4,568	$420,908	$0	$7,050	$427,958
TOTAL	**2,202**	**270,666**	**$25,051,135**	**$0**	**$20,161,288**	**$45,212,423**