

NATIONAL O&G INVENTORY ANALYSIS: PROGRESS UPDATE

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RAMBOLL



OUTLINE

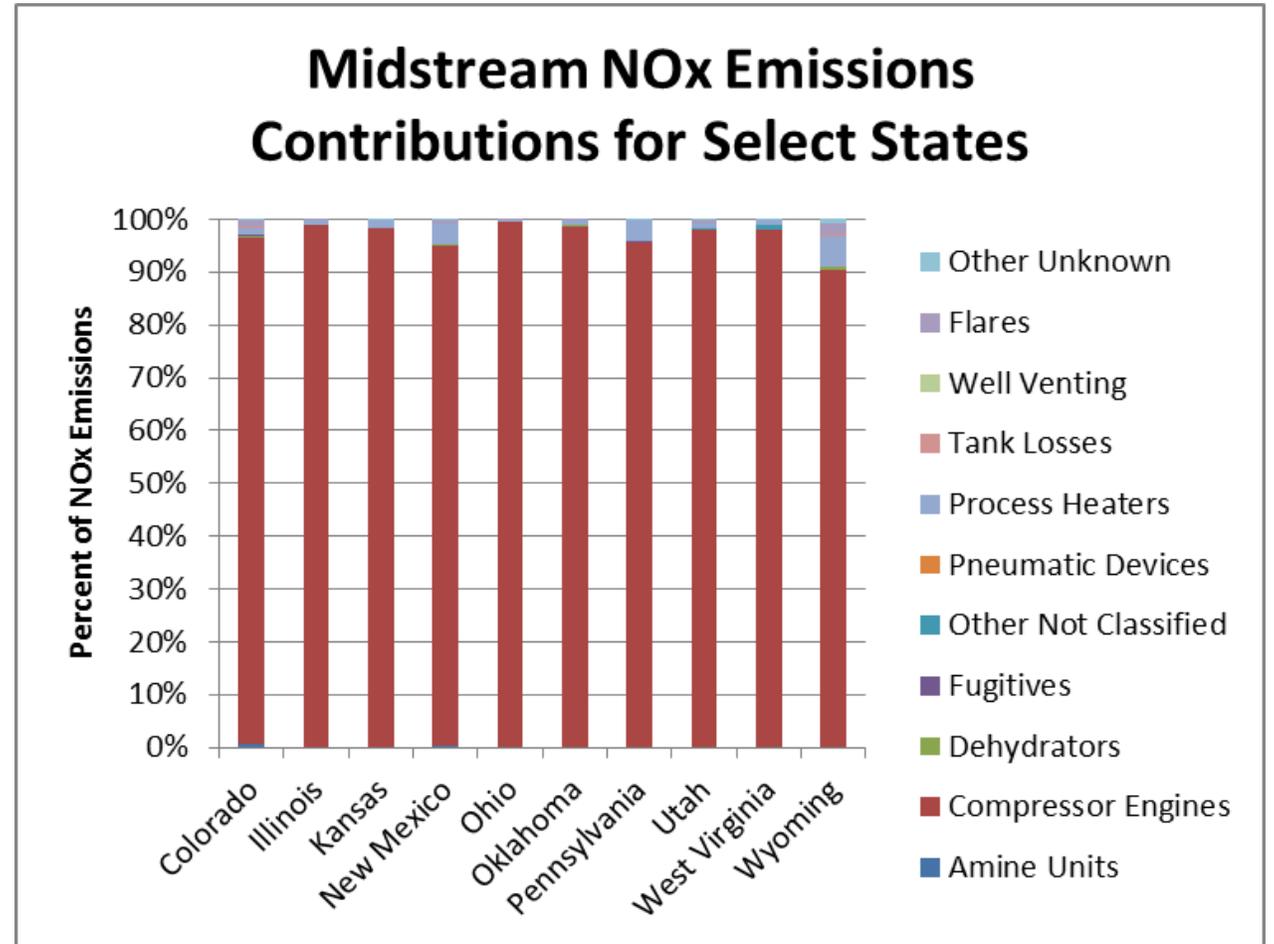
- Point Sources
 - S/L/T point source emission thresholds (see previous presentations)
 - Point source emissions relative to gas production (see previous presentations)
 - **Emissions by source**
 - **GHGRP data**
- Nonpoint Sources
 - **O&G production data comparison**
 - **Basis of O&G Tool input factors**
 - Basis of NEI v1 emissions: O&G Tool or S/L/T submittal (in progress)
 - Source types in NEI, O&G Tool, GHGRP Subpart W Onshore Production Facilities (in progress)
 - O&G Tool input reality checks (in progress)
 - Analysis of GHGRP Subpart W data incorporated into the O&G Tool (in progress)

NEI V1 O&G POINT SOURCES

- Point source emissions include a small amount of wellhead sources for the states that we looked at closely
 - NOx: <4% of emissions from well-site sources
 - VOC: <8% of emissions from well-site sources
- Point sources also include some transmission segment sources.
 - Unable to completely distinguish between the midstream and transmission segment based on applicable NAICS codes
- >99% NOx emissions and >89% of VOC emissions from the following sources
 - Amine Units, Compressor Engines, Dehydrators, Fugitives, Other Not Classified, Process Heaters, Tank Losses, Flares

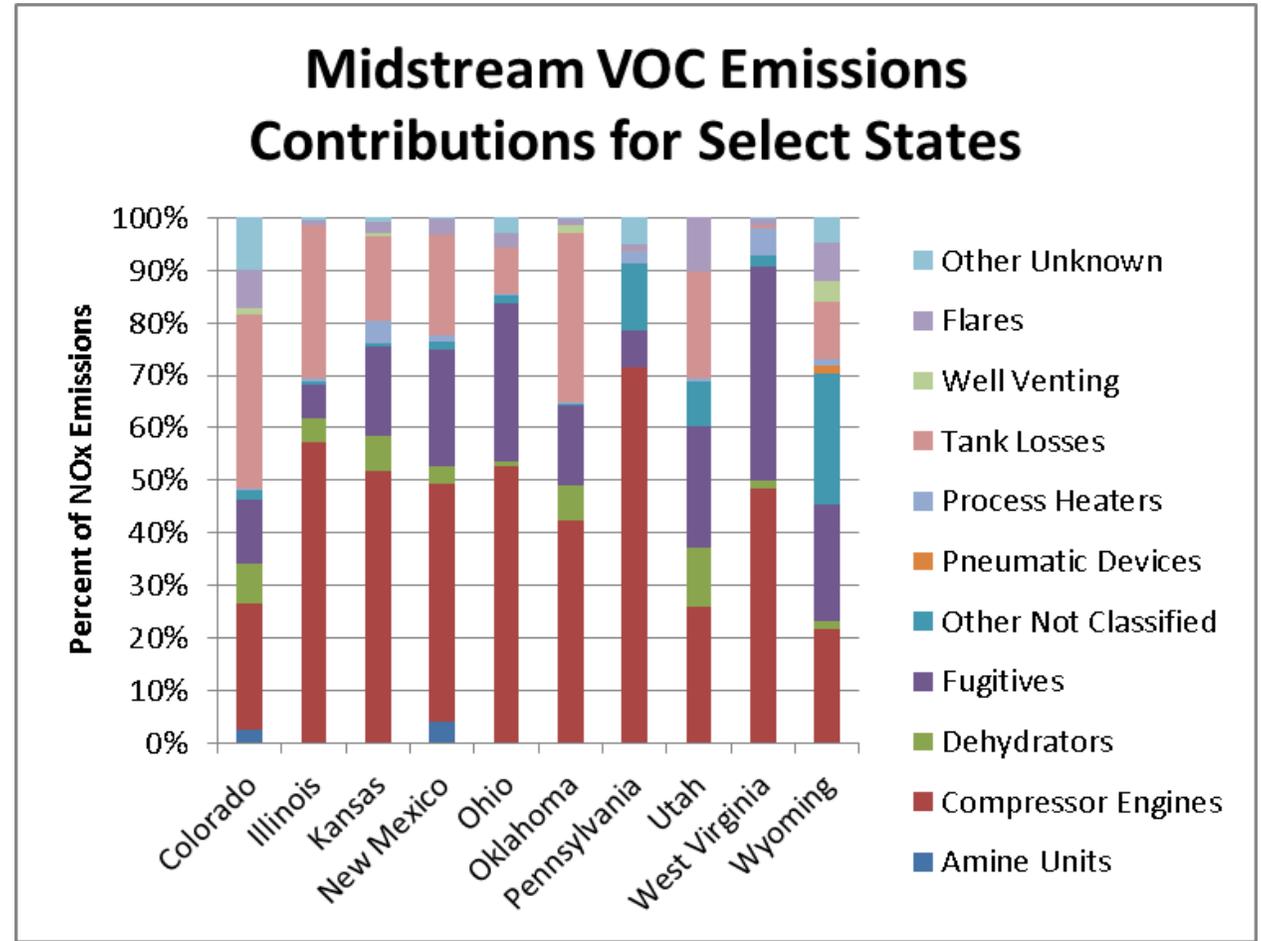
NEI V1 POINT SOURCES CONTRIBUTIONS BY STATE: NOX

- Generally consistent across states
- Primary Source: Compressor Engines
- Secondary Source: Heaters
- Other Minor Sources



NEI V1 POINT SOURCES CONTRIBUTIONS BY STATE: VOC

- Sources generally consistent across states, contributions vary by state
- Primary Sources:
 - Compressor Engines
 - Tank Losses
 - Fugitives



SUBPART W POINT SOURCES

- Midstream points sources correspond to GHGRP Subpart W
 - Onshore natural gas processing plants
 - Onshore natural gas transmission compression
- No common identifier between NEI and GHGRP facilities
 - Time consuming to match between databases
- GHGRP Subpart W does not contain information necessary to understand the level of control for compressor engines
- GHGRP contains information to understand controls for some other sources such as pneumatic controllers and tanks

POINT SOURCES SUMMARY

- Obtained good information about S/L/T point source emission thresholds that allows for an understanding of the extent to which midstream O&G sources may be omitted from the NEI in various S/L/T jurisdictions
- The suite of midstream sources in NEI v1 appear relatively consistent across states
- O&G point sources can include a small amount of well-site facilities (varies by state)
- GHGRP Subpart W and NEI v1 database not able to be easily cross referenced.
- Difficult to completely separate midstream sector from transmission sector sources

- *Conclusions to be finalized and additional details presented in technical memorandum*

NONPOINT SOURCES

- O&G Activity Data
- O&G Tool input factors

O&G PRODUCTION DATA COMPARISON

- Investigating
 - Significant differences
 - Comparisons by oil well and gas well type
 - Methods for determining active well counts

State	Gas Production (mmcf)	Oil Production (Mbbbl)	Spuds
New Mexico			
OGTool_data	1,357,922	123,725	1,420
IHS_data	1,241,851	123,999	1,350
Absolute Difference	116,071	-274	70
Percentage Change	9%	0%	5%
Ohio			
OGTool_data	510,501	14,891	727
IHS_data	507,876	14,785	636
Absolute Difference	2,625	106	91
Percentage Change	1%	1%	13%
Oklahoma			
OGTool_data	2,162,188	117,320	2,955
IHS_data	2,123,776	131,213	2,501
Absolute Difference	38,412	-13,894	454
Percentage Change	2%	-12%	15%
Pennsylvania			
OGTool_data	4,215,729	6,683	1,496
IHS_data	4,257,932	6,835	1,783
Absolute Difference	-42,203	-152	-287
Percentage Change	-1%	-2%	-19%

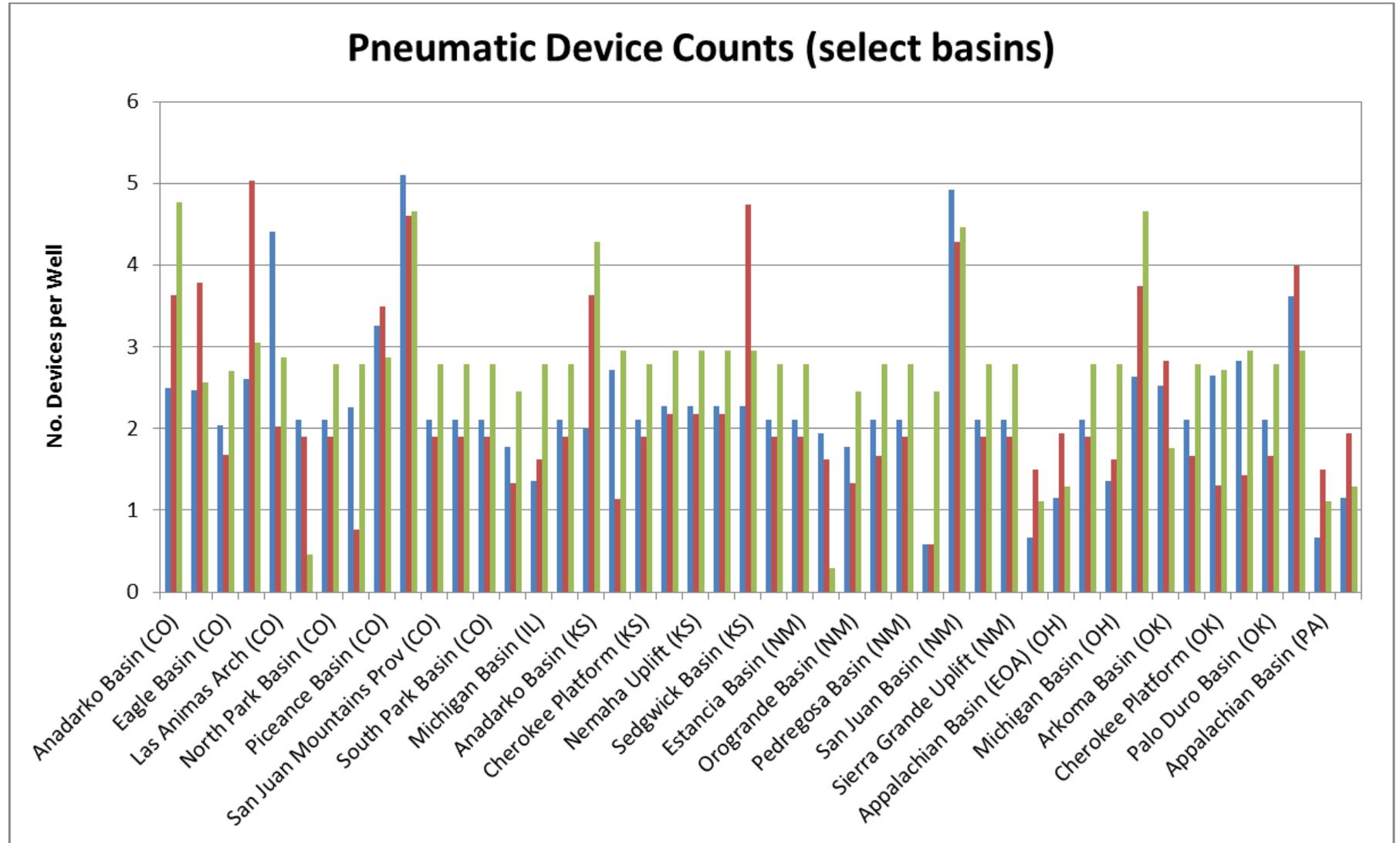
BASIS OF O&G TOOL INPUT FACTORS - SAMPLE

- Numerous data sources by state, source category and within source categories
 - Encompasses both basin factors, speciation factors

State	Source Category	References					
CO	Artificial Lifts	CENSARA_STUDY_2012_AVERAGE	CENSARA_STUDY_2012_EXTENSION				
	Lateral-Gathering Compressors	CENSARA_STUDY_2012_AVERAGE	CENSARA_STUDY_2012_EXTENSION				
	Wellhead Compressors	CENSARA_STUDY_2012_AVERAGE	CENSARA_STUDY_2012_EXTENSION				
	Heaters	CENSARA_STUDY_2012_AVERAGE	CENSARA_STUDY_2012_EXTENSION	WRAP_2013	EPA_2015d		
	Condensate Tanks	CENSARA_STUDY_2012_AVERAGE	CENSARA_STUDY_2012_EXTENSION	WRAP_2013	EPA_2015d	EPA_2014d	
	Dehydrators	CENSARA_STUDY_2012_AVERAGE	CENSARA_STUDY_2012_EXTENSION				
	Pneumatic Devices	CENSARA_STUDY_2012_AVERAGE	CENSARA_STUDY_2012_EXTENSION	WRAP_2013	EPA_2015d	EPA_2014d	EPA_2011
	Liquids Unloading	CENSARA_STUDY_2012_AVERAGE	CENSARA_STUDY_2012_EXTENSION	WRAP_2013	EPA_2014d	EPA_2011	
	Associated Gas	CENSARA_STUDY_2012_AVERAGE	CENSARA_STUDY_2012_EXTENSION	EPA_2015d	EPA_2011		
	Crude Tanks	CENSARA_STUDY_2012_AVERAGE	CENSARA_STUDY_2012_EXTENSION	EPA_2015d			
	Gas-Actuated Pumps	CENSARA_STUDY_2012_AVERAGE	CENSARA_STUDY_2012_EXTENSION	WRAP_2013	EPA_2011		
	Loading Operations	CENSARA_STUDY_2012_AVERAGE	CENSARA_STUDY_2012_EXTENSION	WRAP_2013	EPA_2015c		
	Produced Water	CENSARA_STUDY_2012_AVERAGE	CENSARA_STUDY_2012_EXTENSION				
Fugitives	CENSARA_STUDY_2012_AVERAGE	CENSARA_STUDY_2012_EXTENSION	WRAP_2013	EPA_2011			

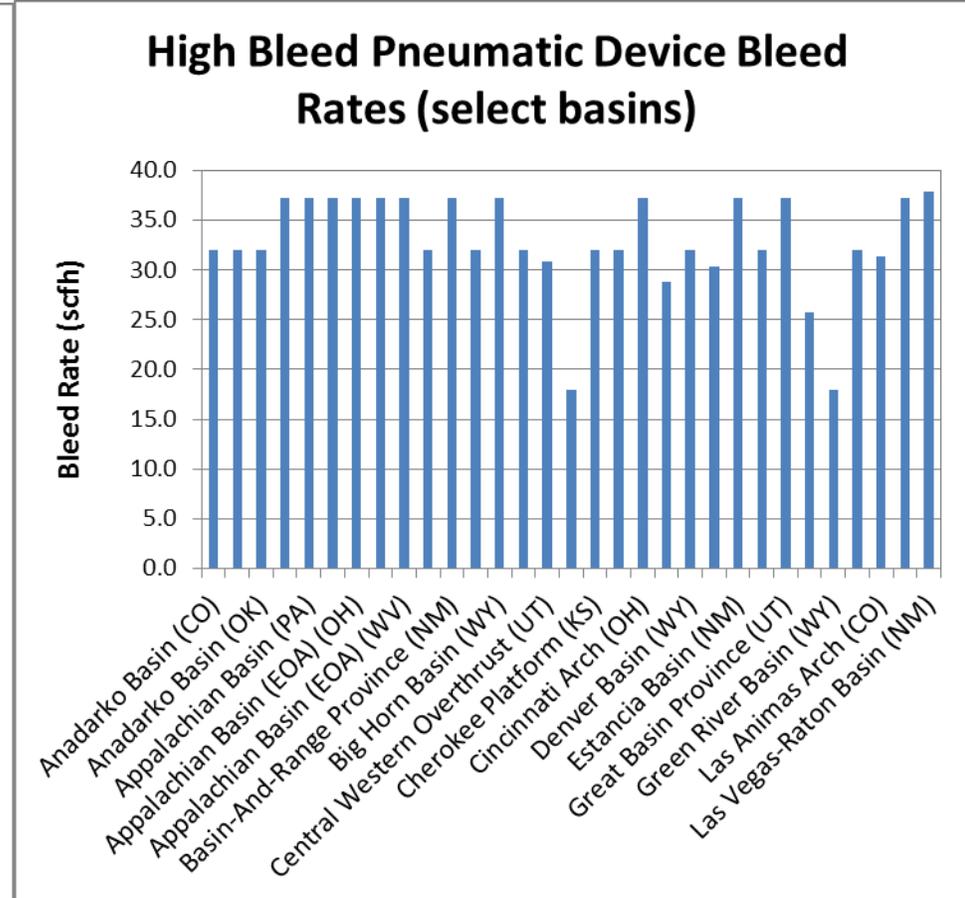
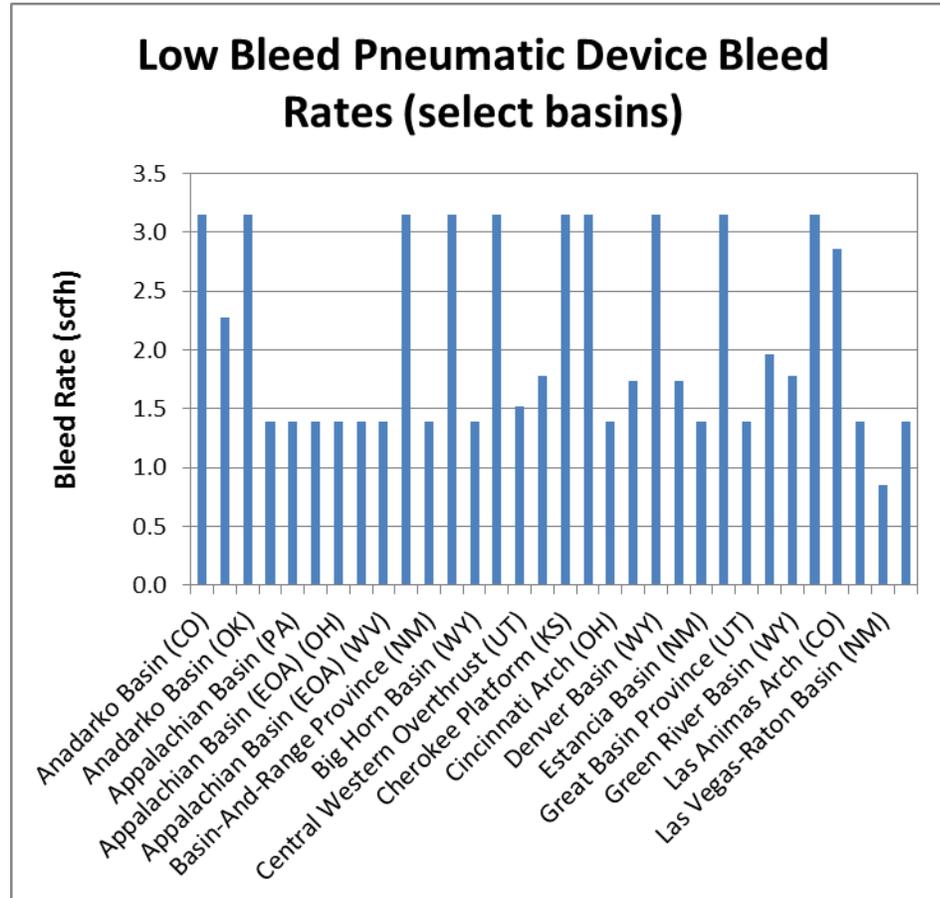
O&G TOOL INPUT REVIEW EXAMPLE: PNEUMATIC DEVICES

- Basin-wide average device counts
- No outliers found



O&G TOOL INPUT REVIEW EXAMPLE: PNEUMATIC DEVICES

- Subpart W standard rates implemented in Tool.
- Working with EPA to confirm the Tool bleed rates.



SCHEDULE

- Task 1: National Analysis
 - 12/8: Memo to WESTAR & other RPO funders
 - Review key findings from remaining Task 1 analyses on O&G Committee call
 - Report comments due by Dec 31
 - 1/12: Summarize and discuss final memo and report
- Task 2: Basin-level Analysis
 - 1st half of November: Initial outreach
 - Point and nonpoint sources: Data available to characterize extent of control and methane emissions
 - Progress update during 12/8 O&G Committee call

END