

WRAP OGWG: O&G EI PHASE 2 STATUS UPDATE

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PRESENTATION OUTLINE

WRAP Region Draft
O&G Inventory

01

2014 O&G Activity
Data

02

Emission Inventory
Improvements

03

Next Steps

04

EMISSION INVENTORY COMPILATION

- Scope: Well-site and midstream O&G sources in the WRAP region
- Calendar Year 2014
- Criteria Pollutants (NO_x, VOC, CO, PM₁₀, PM_{2.5}, SO₂)
 - [Greater San Juan and Permian Inventory Study](#)
 - [IWDW Intermountain West 2014 O&G Inventories](#)
 - [2014 NEI \(version2\)](#)
- Greenhouse Gases (CO₂, CH₄, N₂O)
 - Greater San Juan and Permian Inventory Study
 - GHG: CAP emission ratios

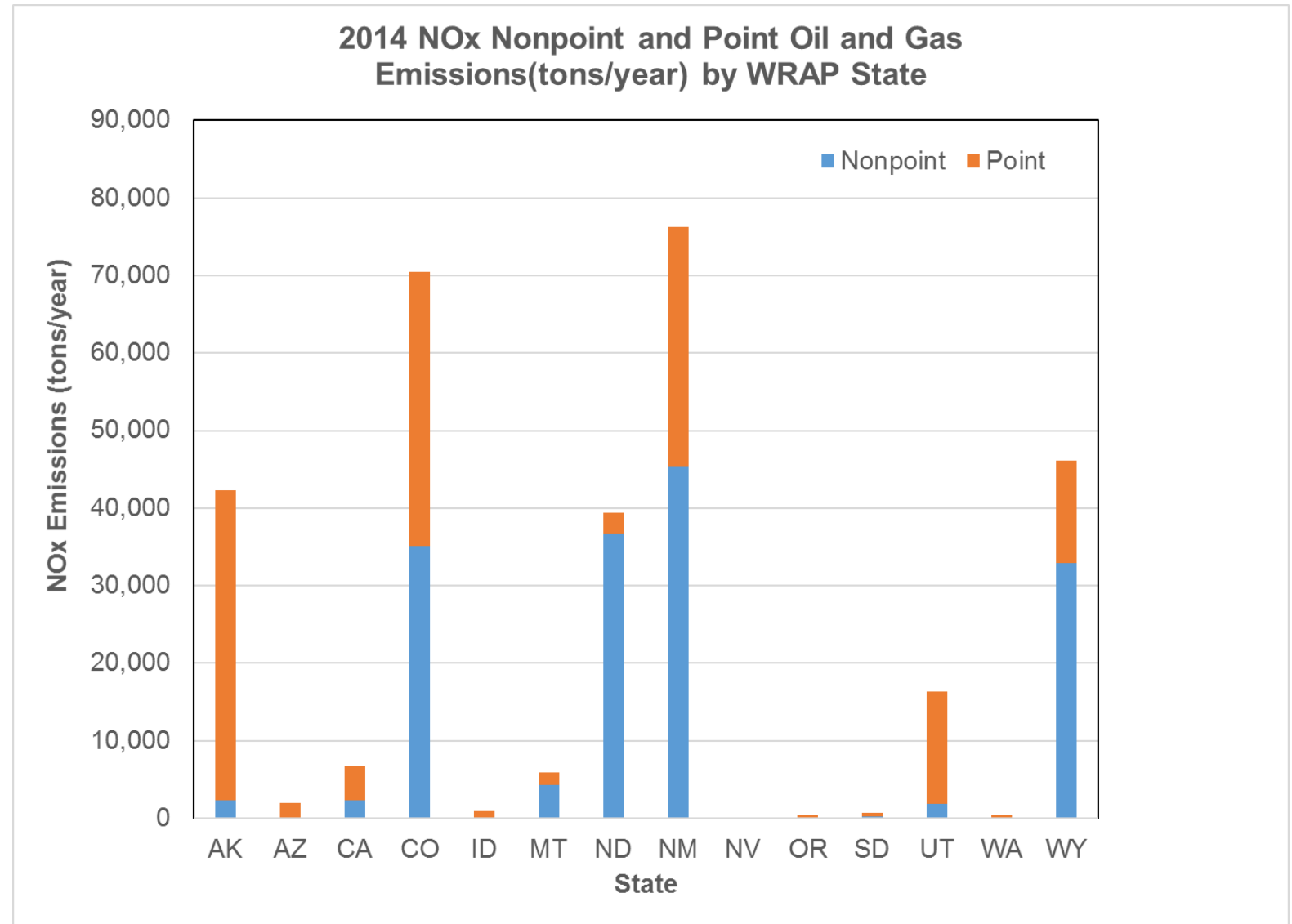
EMISSION INVENTORY SUMMARY

State	Emissions (tons/year)						
	NOx	VOC	CO	SOx	PM ₁₀	PM _{2.5}	CO _{2e}
AK	42,348	27,097	12,923	1,953	1,113	1,088	n/a
AZ	1,960	280	439	33	51	51	1,208,513
CA	6,773	114,159	5,622	1,160	1,255	1,249	n/a
CO	70,426	189,599	59,543	713	1,949	1,949	18,897,968
ID	889	34	272	4	10	10	247,812
MT	5,933	50,995	5,448	288	175	175	4,842,931
ND	39,365	478,167	32,000	3,847	1,325	1,325	16,807,577
NM	76,295	211,632	100,314	12,665	2,131	2,131	39,374,875
NV	156	269	111	15	11	11	107,642
OR	454	73	263	13	20	20	216,381
SD	693	3,090	496	13	77	77	698,609
UT	16,379	112,485	14,145	586	706	706	19,034,335
WA	444	36	301	14	14	14	202,836
WY	46,171	264,821	21,384	6,888	1,276	1,276	20,303,798
Total	308,286	1,452,737	253,260	28,191	10,115	10,083	121,943,276

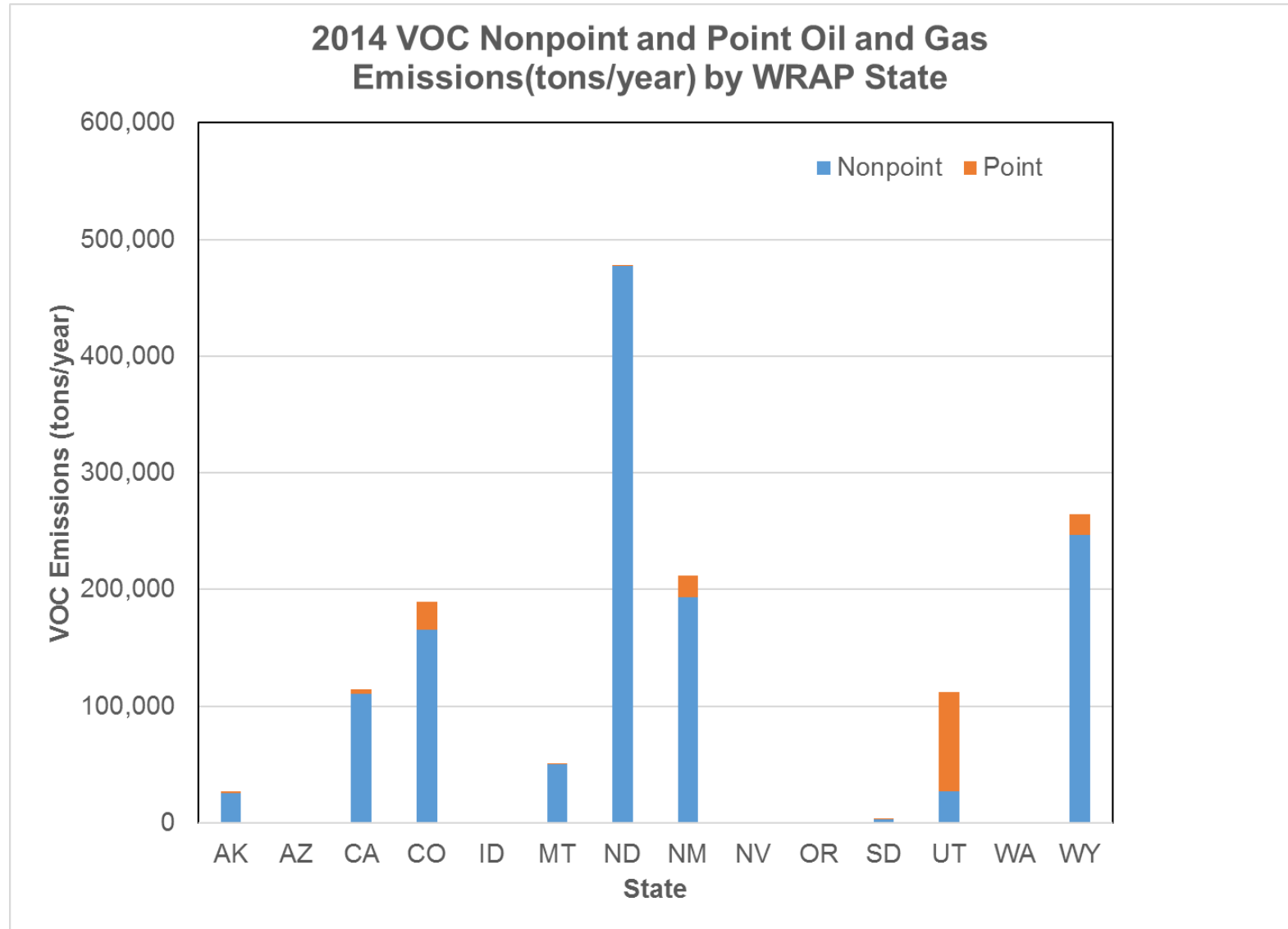
* Preliminary estimates based on GHG:CAP ratios

EMISSION INVENTORY

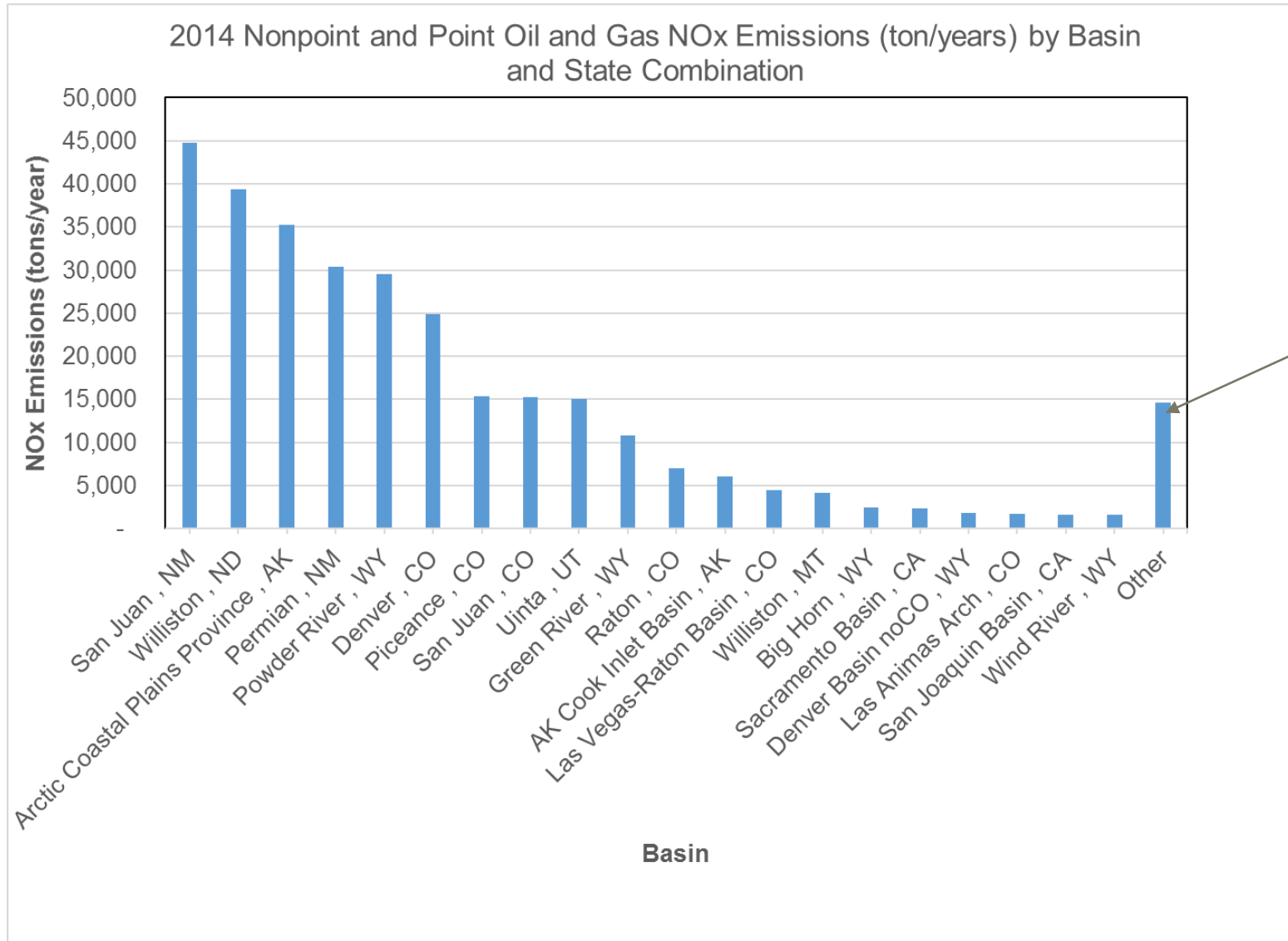
- Notes:
 - UT: several well-site sources included as point sources
 - AK: NOx emissions dominated by point source facilities
 - NEI typically includes well-site sources in nonpoint sector under SCC 2310* regardless of agency how agencies track these sources



EMISSION INVENTORY

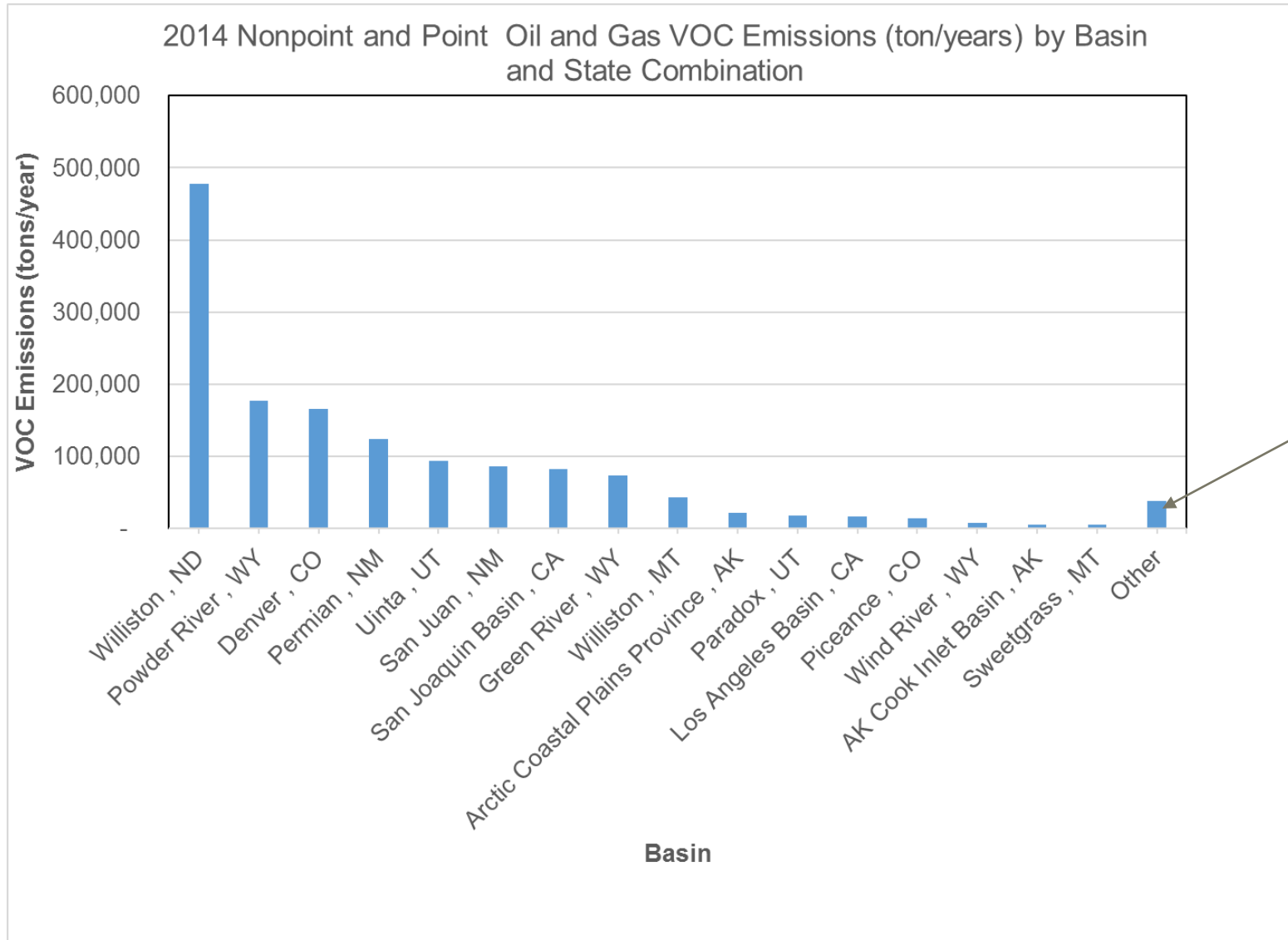


EMISSION INVENTORY



5% of emissions, well distributed across several WRAP states

EMISSION INVENTORY



3% of emissions, distributed across several WRAP states

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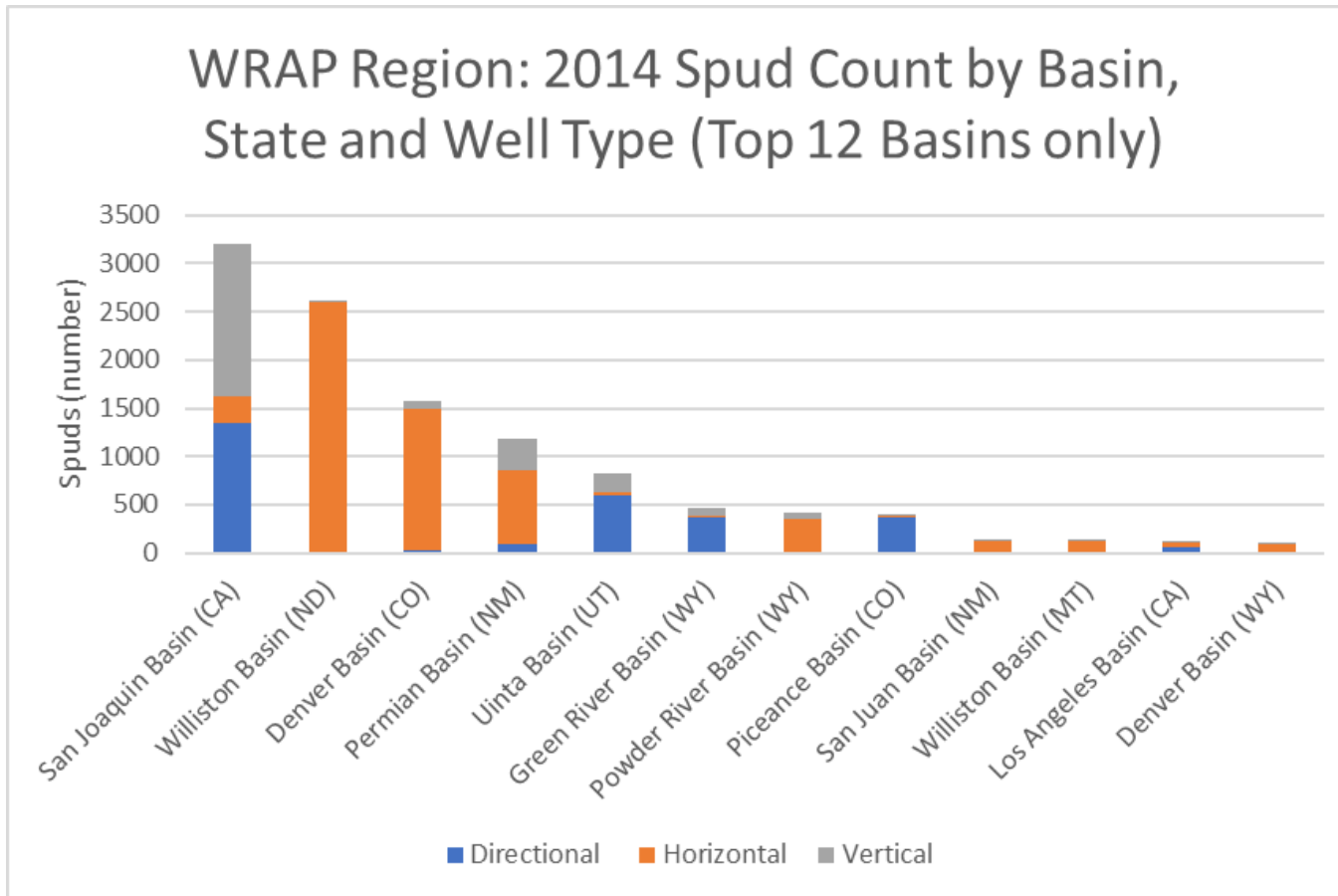
O&G ACTIVITY DATA

- Data source: IHS Enerdeq
- 2014 Calendar Year
- Metrics:
 - Well count, gas production, oil production
 - By well type
- New information not included in previous compilations
 - Spud type: vertical/directional/horizontal
 - IHS Play type

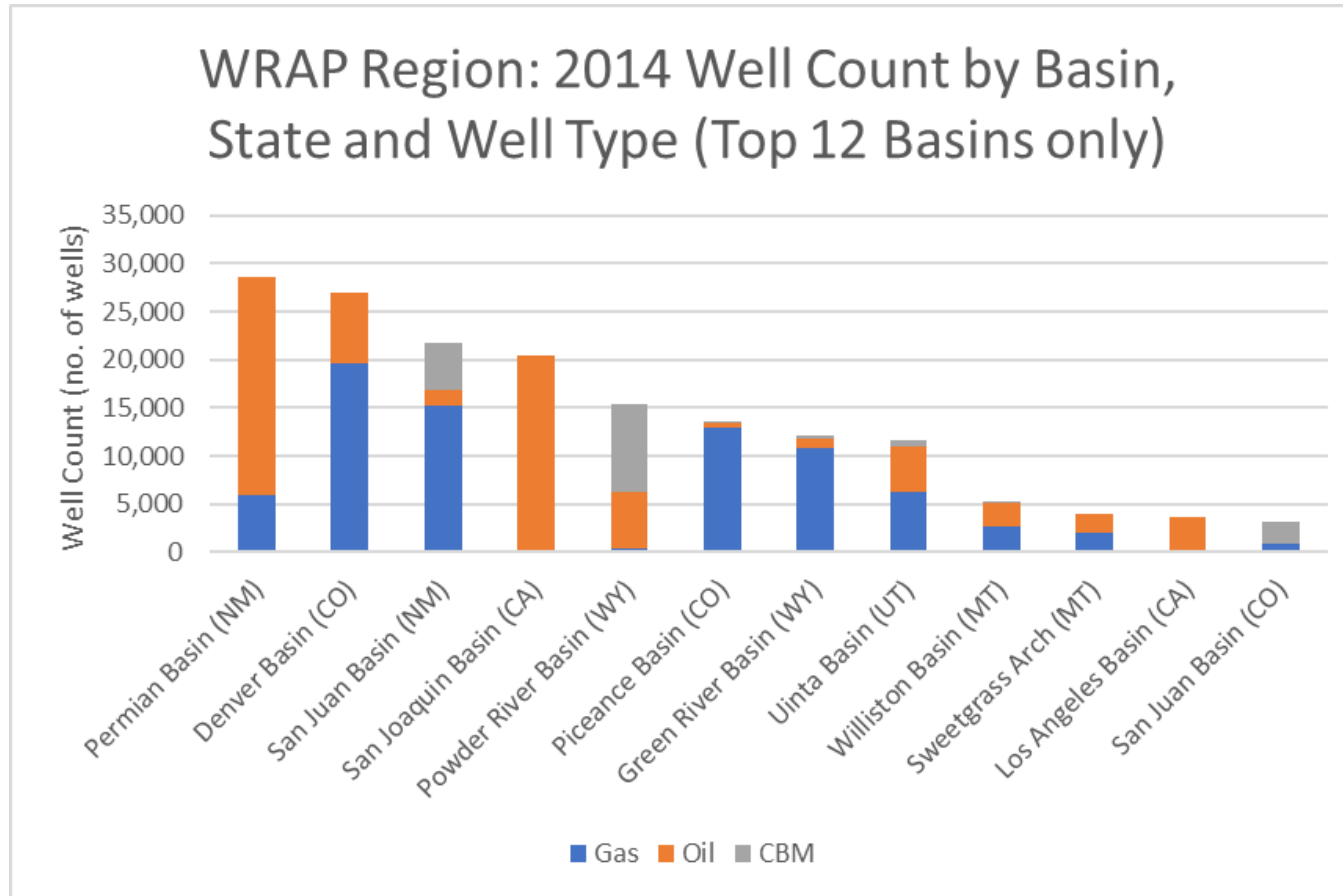
O&G ACTIVITY DATA

- IHS Enerdeq
 - Based on data from each state's OGCC or equivalent agency
 - Data available in consistent formats across the US
 - Ramboll has developed scripts to efficiently compile IHS Enerdeq outputs for large areas
 - Examples of types of data available
 - Oil or gas well type assigned to each well based on each state's classification
 - CBM wells flagged
 - Comprehensive liquid hydrocarbon, gas, and water production at the well level
 - Vertical/horizontal/directional spud type attribute for each well for both spuds and producing wells
 - By play type and by play name information available for some wells – relatively new data fields, not universally available at this time
 - Copyright protections preclude publishing/sharing well-level data

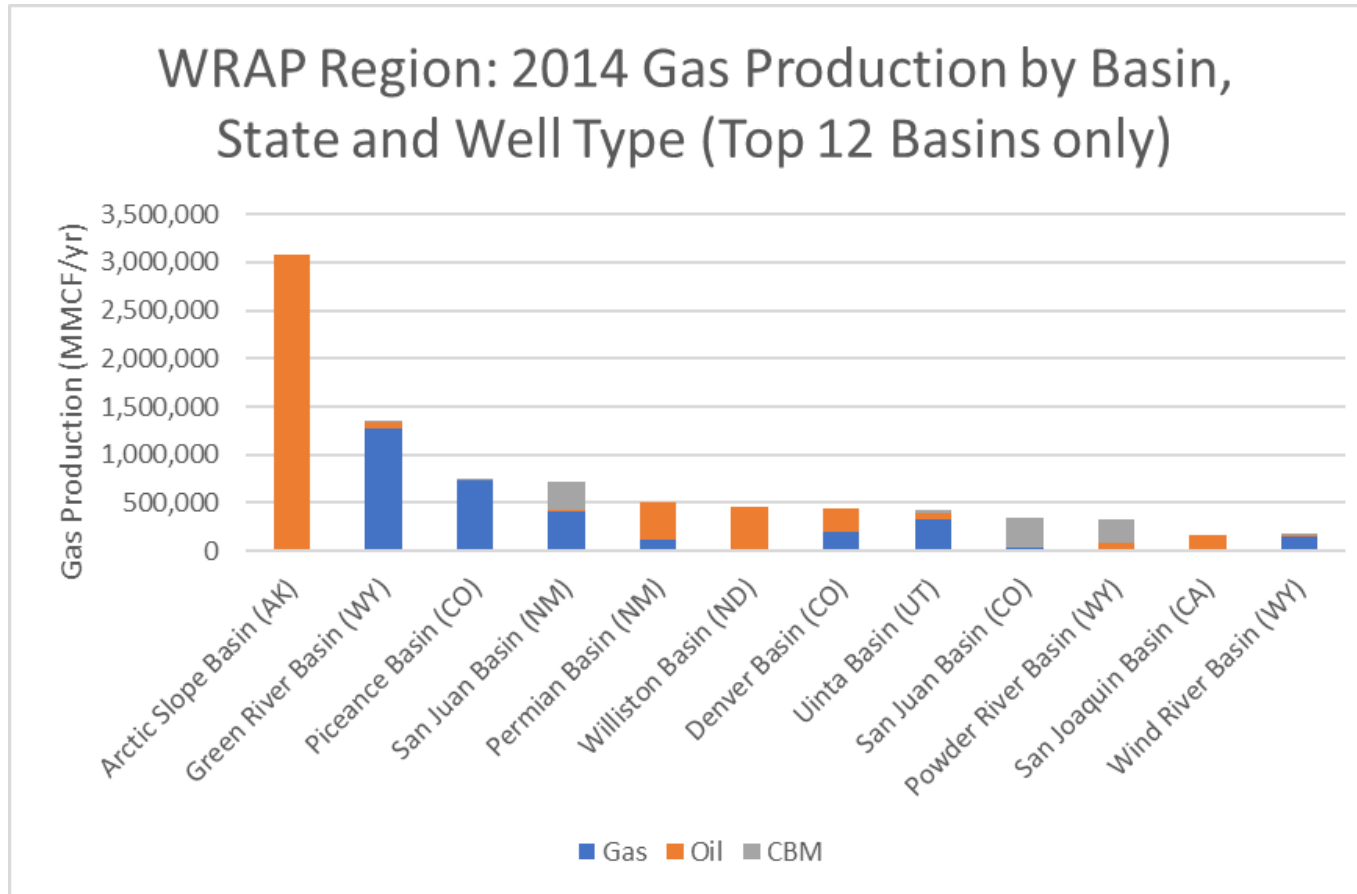
O&G ACTIVITY DATA FOR 12 SELECTED BASINS



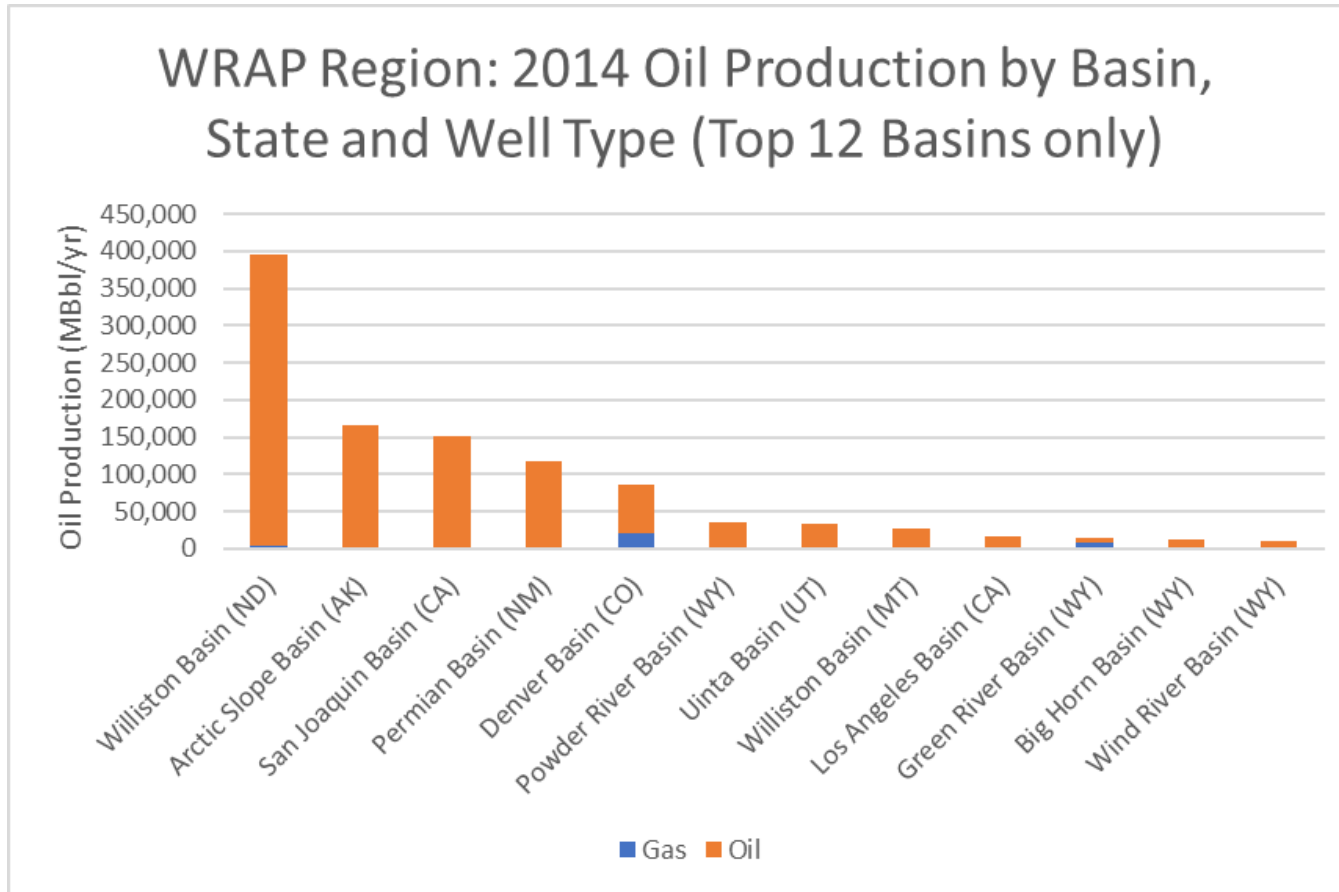
O&G ACTIVITY DATA FOR 12 SELECTED BASINS



O&G ACTIVITY DATA FOR 12 SELECTED BASINS



O&G ACTIVITY DATA FOR 12 SELECTED BASINS



O&G ACTIVITY DATA –EXAMPLE BASIN DATA (DENVER BASIN)

Parameter	Directional	Horizontal	Vertical	Not Available	Totals
Spud Count	20	1557	83	0	1660
Well Count	5,242	2,753	19,183	21	27,199
Oil Production (MBbl/yr)	5,296	75,514	8,863	13	89,686
Gas Production (MMCF/yr)	55,025	274,047	109,170	72	438,314

- Drilling
 - Vast majority are horizontal spuds (94%)
- Well count
 - Majority (71%) are vertical wells
 - Small fraction are horizontal (10%) and directional (19%) wells
- Liquid hydrocarbon production
 - Majority (84%) from horizontal wells
 - Small fraction from vertical (10%) and directional (6%) wells

O&G ACTIVITY DATA –EXAMPLE BASIN DATA (DENVER BASIN)

PlayName (PlayType)	2014 O&G Activity Parameter			
	Well Count	Oil and Condensate (MBbl/yr)	Gas (MMCF/yr)	Water (Mbbbl/yr)
ATOKA/CHEROKEE (TIGHT OIL (L))	25	203	180	316
LYONS/WOLFCAMP (TIGHT OIL (L))	15	646	0	1,375
NIOBRARA - CANON CITY EMBAYMENT (TIGHT OIL (L))	2	2	40	1
NIOBRARA - WATTENBERG (TIGHT GAS (T))	6,397	5,795	59,729	1,149
NIOBRARA OIL - DENVER BASIN (TIGHT OIL (L))	2,842	55,390	208,298	19,338
Not Available	10,377	24,044	117,798	59,347
WATTENBERG TIGHT GAS (TIGHT GAS (T))	7,541	3,606	52,267	1,521
Totals	27,199	89,686	438,314	83,046

- Play Name and Play Type are recent additions to IHS
- Incomplete data for Play Name and Play Type, therefore may not be able to use in inventory improvements

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EMISSION INVENTORY IMPROVEMENTS –TOPICS

- **Improve with existing datasets**

- Addition of emissions from pipelines (basis: IHS pipeline network)
- GHG inventory improvement/reconciliation (basis: GHGRP, US GHG Sinks)
- High emitter updates (limited studies with process specific emission rates)

- **Improve with surveys**

- Equipment counts, characteristics, and age by well configuration (wellhead production equipment setup, drilling/fracing engines)
- Control penetration rates (fraction of equipment controlled by type)
- Gas compositions (by well type)
- For areas in which data are available, include well-site sources in the point source inventory
- Need to prioritize inventory improvements based on work with existing datasets vs. survey efforts to gather and incorporate new data from agencies/operators

EMISSION INVENTORY IMPROVEMENTS – EMAIL INPUT

Topics	Interest	[dataset]
Gas compositions/speciation		[WYDEQ gas composition]
Emission factors	<ul style="list-style-type: none"> Generalized process specific Vented/fugitive leaks Hydraulic fracturing fleets Fleet turnover rates 	
Source categories omitted from/misrepresented in the current inventory	<ul style="list-style-type: none"> Drip tanks (NG pipelines) Evaporation ponds Bradenhead/casinghead valves 	
Control effects accounting	Capture efficiency, rule effectiveness	
Other	<ul style="list-style-type: none"> Midstream permit facility emissions EPA Tool differences & factor updates BOEM Arctic AQ Study Emissions BLM NEPA Analyses (FY projections) Tribal Oil and Gas 	<ul style="list-style-type: none"> [OGCC Activity] [2015 Southern Ute Inventory]

EMISSION INVENTORY IMPROVEMENTS – EMAIL INPUT

Topics	Interest	[dataset]
Gas compositions/speciation		[WYDEQ gas composition]
Emission factors	Generalized process specific Vented/fugitive leaks Hydraulic fracturing fleets Fleet turnover rates	Published/Grey Literature
	Surveys	
Source categories omitted from/misrepresented in the current inventory	Drip tanks (NG pipelines) Evaporation ponds Bradenhead/casinghead valves	Surveys & Published/Grey Literature
Control effects accounting	Capture efficiency, rule effectiveness	Surveys & Published/Grey Literature
Other	EPA Input/Reports Optional Task Midstream permit facility emissions EPA Tool differences & factor updates BOEM Arctic AQ Study Emissions BLM NEPA Analyses (FY projections) Tribal Oil and Gas	Surveys Published/Grey Literature [2015 Southern Ute Inventory] [OGCC Activity]

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SUMMARY

- Member review and comment requested:
 - WRAP Region 2014 O&G Emission Inventory spreadsheet (comments by Aug 28, 2018)
 - WRAP Region 2014 O&G Activity Data spreadsheet (comments by Aug 28, 2018)
- Next steps:
 - Prioritize emission inventory improvements (Aug 2018)
 - Finalize version 1 inventory and 2014 O&G activity data (Sep 2018)
 - Technical improvements tasks (Sep 2018)
 - Draft survey (Oct 2018)

QUESTIONS?