

# OIL & GAS EMISSIONS, PROJECTIONS, AND EVALUATION TOOLS FROM THE OIL AND GAS WORKING GROUP (OGWG)

John Grant and Amnon Bar-Ilan

May 20, 2020

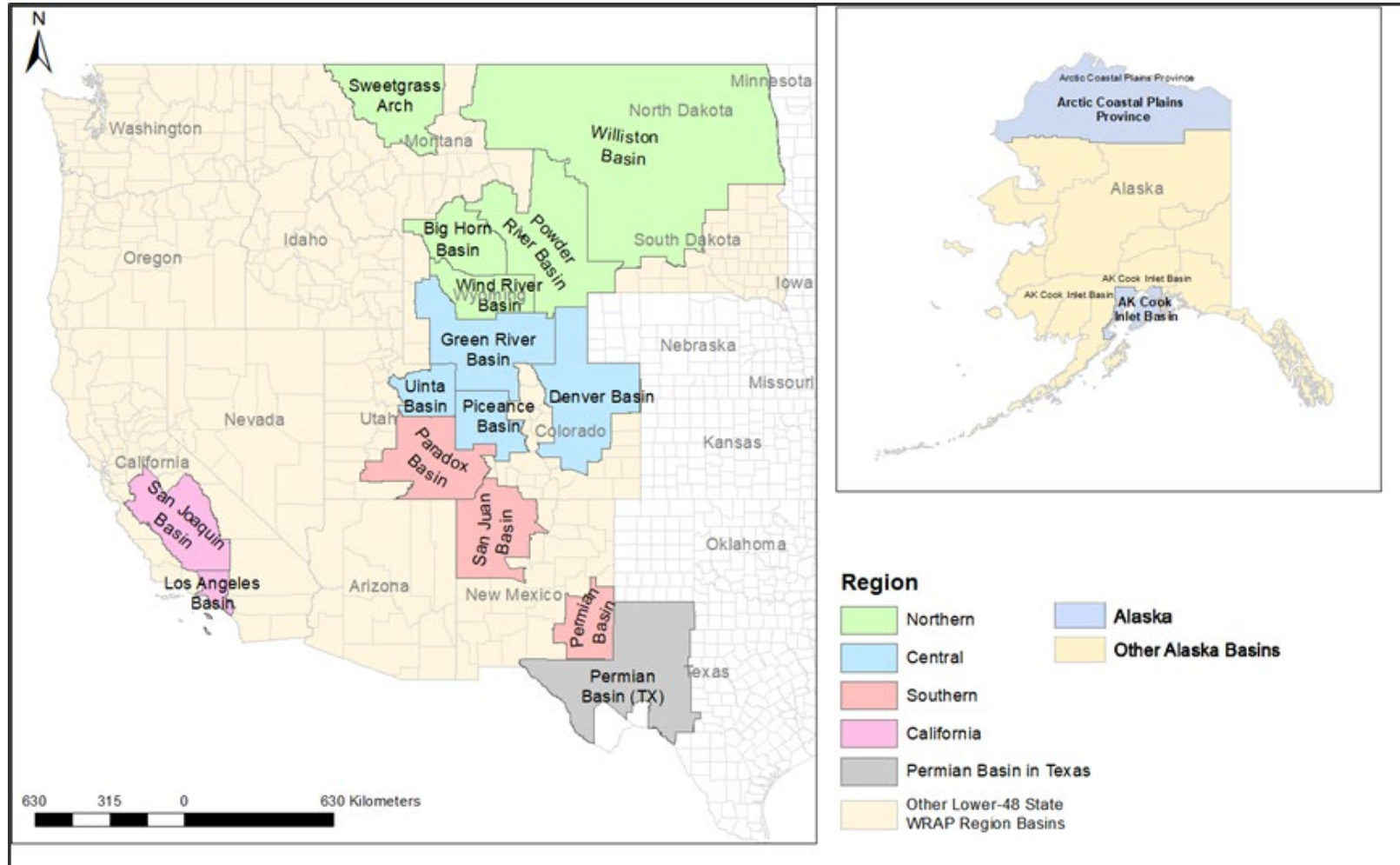
Presented at: **WRAP Regional Haze Workplan Completion and Results Meeting**



# OUTLINE

- Context for OGWG efforts
- Baseline inventory
- Future year inventories
- Additional controls analysis
- Agency program review

# WRAP REGION O&G BASINS



- Substantial unconventional development (e.g., Williston [Bakken], DJ [Niobrara], Permian)
- 7 out of 10 top crude oil producing states in US
- Notable crude oil production increases in recent years for North Dakota, New Mexico, Colorado, Wyoming, and Utah
- Crude oil production decreases in recent years for Alaska and California

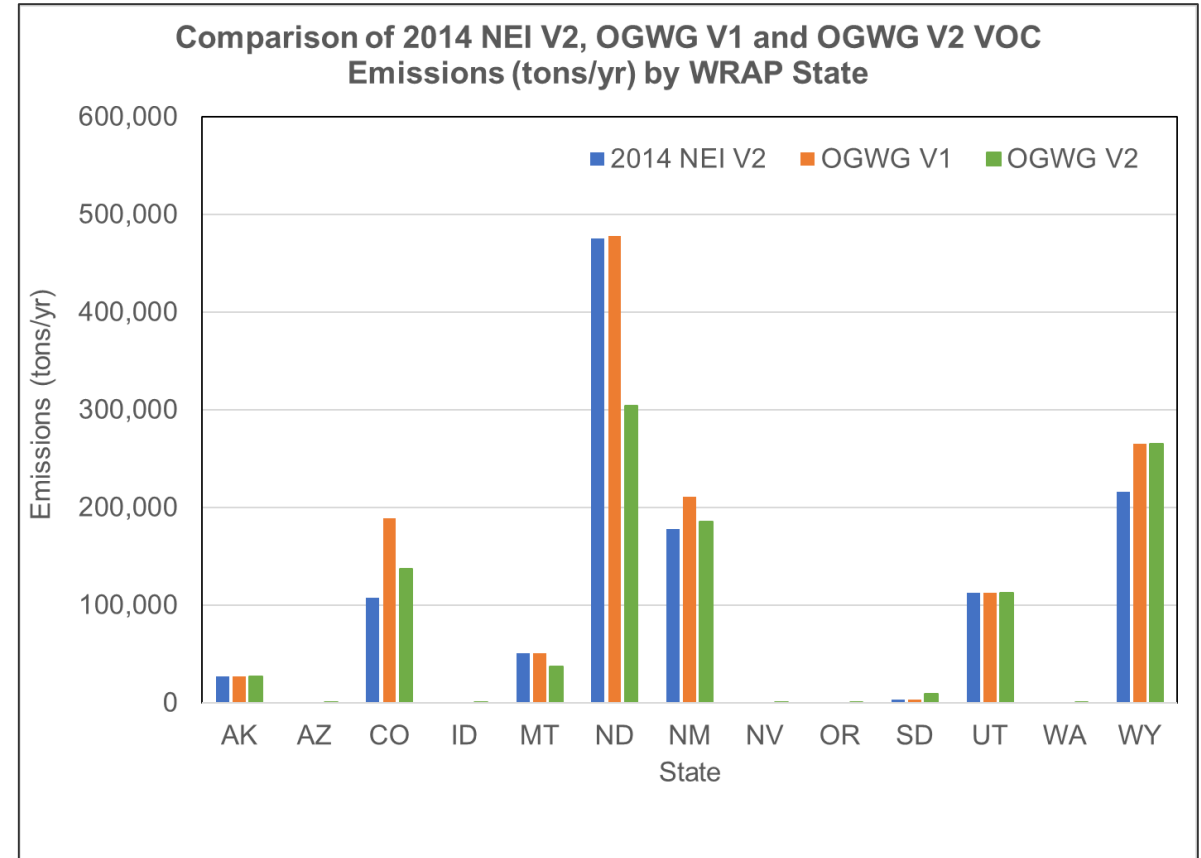
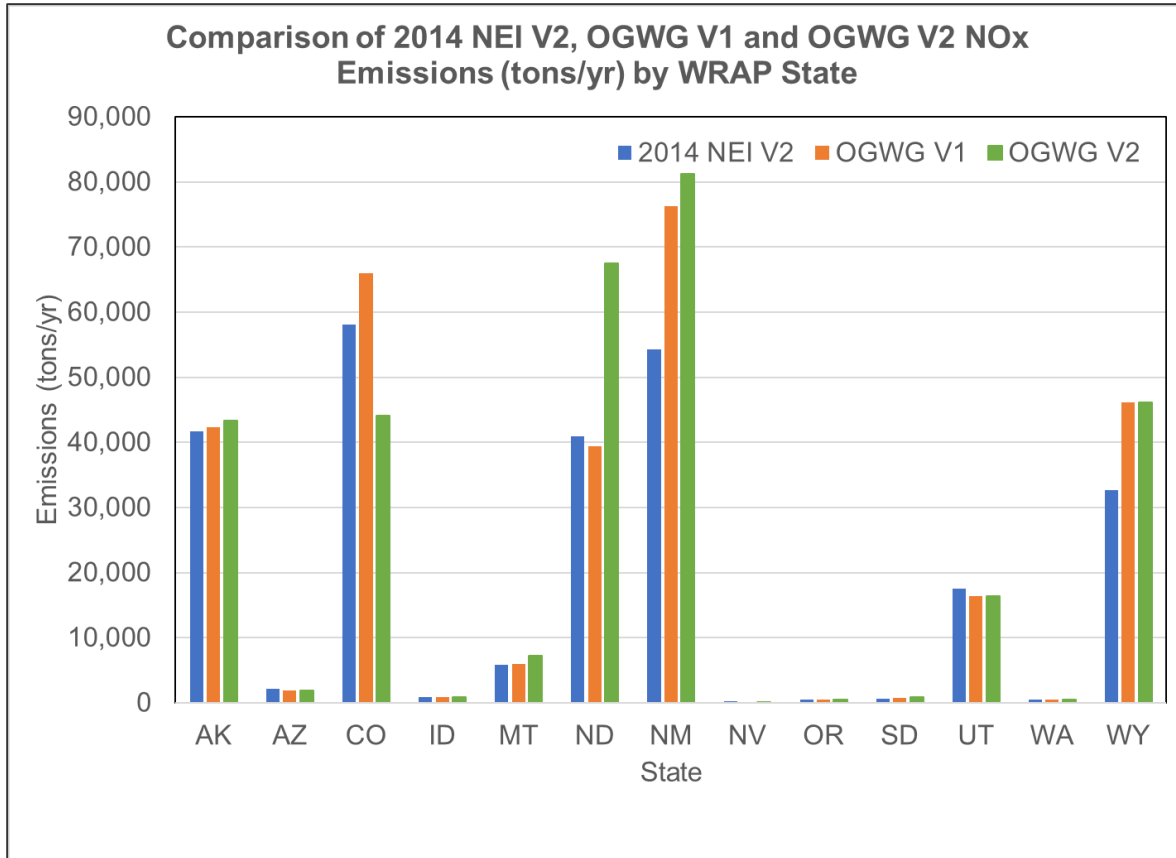
# HISTORY OF WRAP O&G EMISSION INVENTORIES

- [WRAP Phase I and Phase II](#): 2002 and 2005 base years, 2018 future year, controls analysis
- [WRAP Phase III](#): 2006 base year, 2012 or 2015 future year, 9 major Intermountain West Basins
- [WestJump AQMS](#): 2008 base year update
- [Western Air Quality Study](#) (WAQS): 2011 base year update and 2018 future year, and 2014 base year update
- [Williston and Great Plains Basins](#): 2011 base year, 2015 future year
- [Greater San Juan and Permian Basins](#): 2014 base year, 2028 future year
- **[WRAP OGWG](#): 2014 base year, 2028 future year, additional controls, agency program review**

# CIRCA-2014 BASELINE INVENTORY

- Incorporated latest CDPHE Colorado and Utah Air Agencies Uinta Basin emission inventories
- Survey O&G operators in collaboration with State Air Agencies
- Available from 2016 modeling collaborative
- Products
  - [Revised Final Report](#)
  - [Inventory Spreadsheet](#)
  - [Gas specation profiles](#)
  - [Complete survey, Fleet turnover and controls-focused survey](#)
  - SMOKE inputs for Regional Haze modeling: inventory, spatial surrogates, speciation profiles

# CIRCA-2014 BASELINE INVENTORY



\* OGWG v1: Draft OGWG Inventory

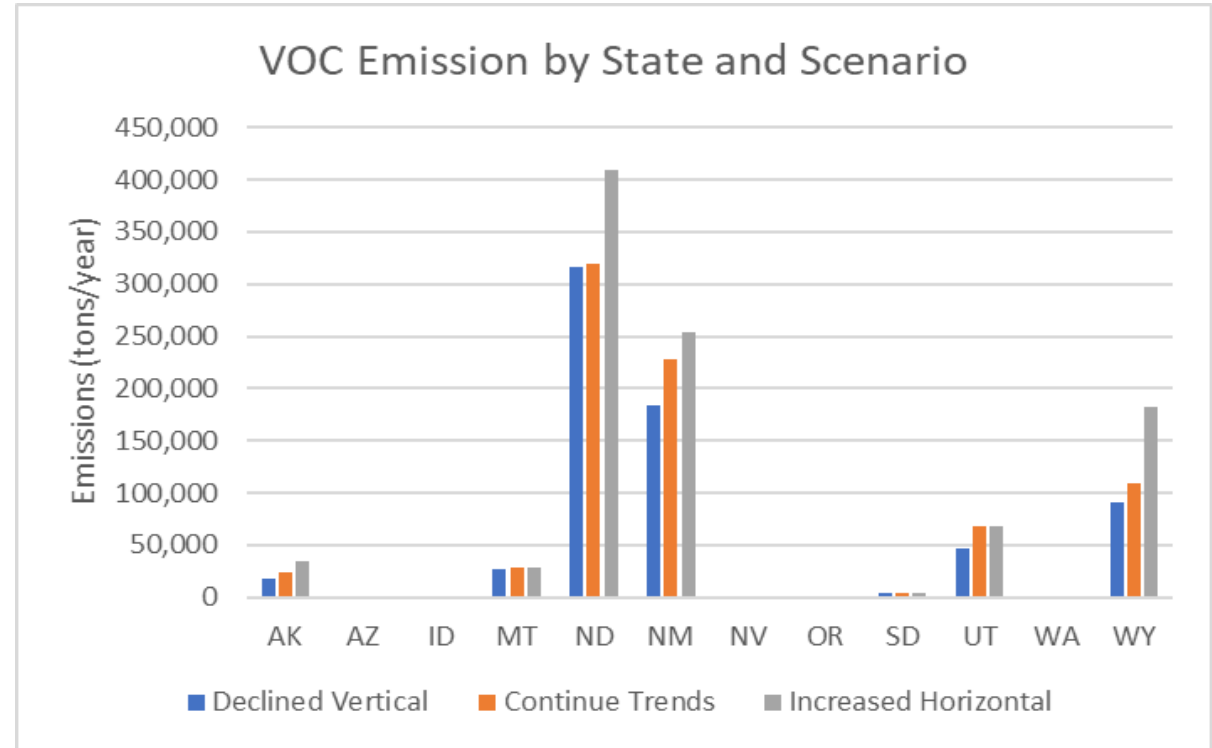
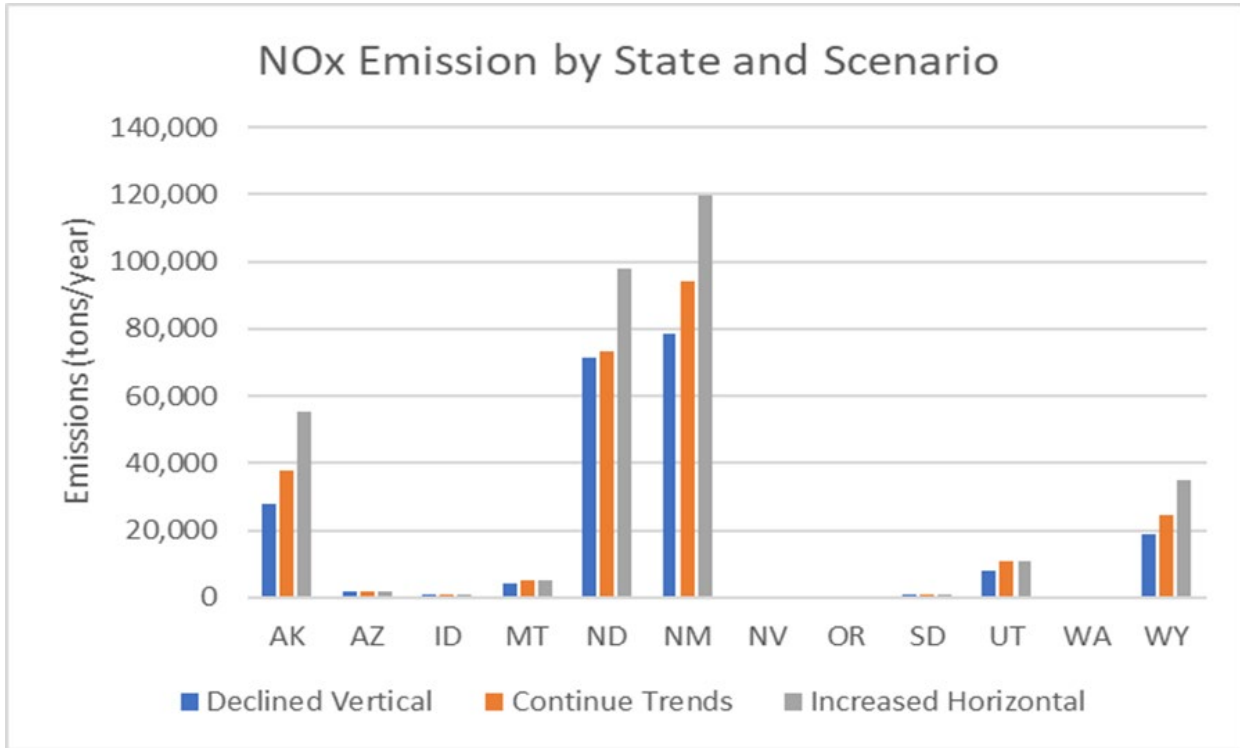
\* OGWG v2: Final OGWG Inventory



# FUTURE YEAR EMISSION INVENTORIES

- Scenarios:
  - **Medium:** “Continuation of Historical Trends” (prior to COVID-19)
  - **Low:** Reduced Legacy Well Activity
    - Legacy wells retire more quickly (twice as fast as medium scenario)
    - Multi-stage fracing (horizontal) wells: same as medium scenario
  - **High:** Increased Horizontal Well Activity
    - Multi-stage fracing (horizontal) wells O&G activity increases more quickly that medium scenario
    - Legacy (vertical) wells: same as medium scenario
- Medium scenario incorporated CDPHE Colorado emission inventory forecast
- Products:
  - Medium Scenario: [Final Report](#) and [Inventory Spreadsheet](#)
  - Low and High Scenarios: [Memorandum](#), [Future Year Lower Scenario Inventory Spreadsheet](#), [Future Year Higher Scenario Inventory Spreadsheet](#)

# FUTURE YEAR EMISSION INVENTORIES





# ADDITIONAL REASONABLE CONTROL STRATEGIES (ARCS)

- Summarized:
  - Future year NOx emissions by source category and state
  - Four factor criteria (cost, time, energy/non-air quality impacts, useful life) for selecting ARCS
  - Available NOx controls (sample excerpt below)
  - Process for selecting ARCS

- Products:

- [Memorandum](#)
- [reporting template spreadsheet](#)

Control Measure	Applicability Range	Average Cost per Ton of NOx Reduction (\$/ton)	Control Efficiency	Energy and Non-Air Quality Environmental Impacts
<b>Natural Gas Turbines</b>				
Selective Catalytic Reduction and Steam Injection	NOx<1tpd	\$3,226	95%	steam and energy requirements
	NOx>1tpd	\$1,348	95%	
<b>Natural Gas Reciprocating Internal Combustion Engine (Rich Burn)</b>				
Replace with Electric Motors	-	\$100-\$4,700	60-100% <sup>h</sup>	Electricity consumption and electricity distribution infrastructure <sup>g</sup>
<b>Flare or Enclosed Combustor</b>				
Vapor Recovery Unit (storage tank)	-	not readily available <sup>a</sup>	up to 100%	Fossil fuel or electricity consumption associated with small reciprocating engine typically used in these systems.

# AGENCY PROGRAM REVIEW

- State agency contributions
  - **Report:** Program summary descriptions: current oil and gas regulations for each agency's jurisdiction
  - **Supplement:** Comprehensive listing and summarization of state regulations
- Ramboll (editor): integrated state contributions to create a seamless document
- Products:
  - **Report:** [Summary of State Regulations Applicable to Oil and Gas Sources in the Western States Air Resources Council-Western Regional Air Partnership Region](#)
  - **Supplement:** [Detailed State Regulation Summary Table](#)

# ACKNOWLEDGEMENTS

- **WRAP OGWG co-chairs:** Amanda Brimmer, Darla Potter, Mark Jones
- **WRAP OGWG Project Management Team:** Dale Wells, Melissa Hovey, Molly Birnbaum, Sheila Vance
- **WRAP OGWG Members**
- **WRAP Air Quality Program Manager:** Tom Moore

# QUESTIONS?

John Grant

[jgrant@ramboll.com](mailto:jgrant@ramboll.com)

(415) 899-0706

Amnon Bar-Ilan

[abarilan@ramboll.com](mailto:abarilan@ramboll.com)

(415) 899-0732