

O&G ACTIVITY FORECASTS

APPLIED TO WRAP FUTURE YEAR EMISSION INVENTORIES & AVAILABLE FROM THE EIA ANNUAL ENERGY OUTLOOK

August 3, 2021

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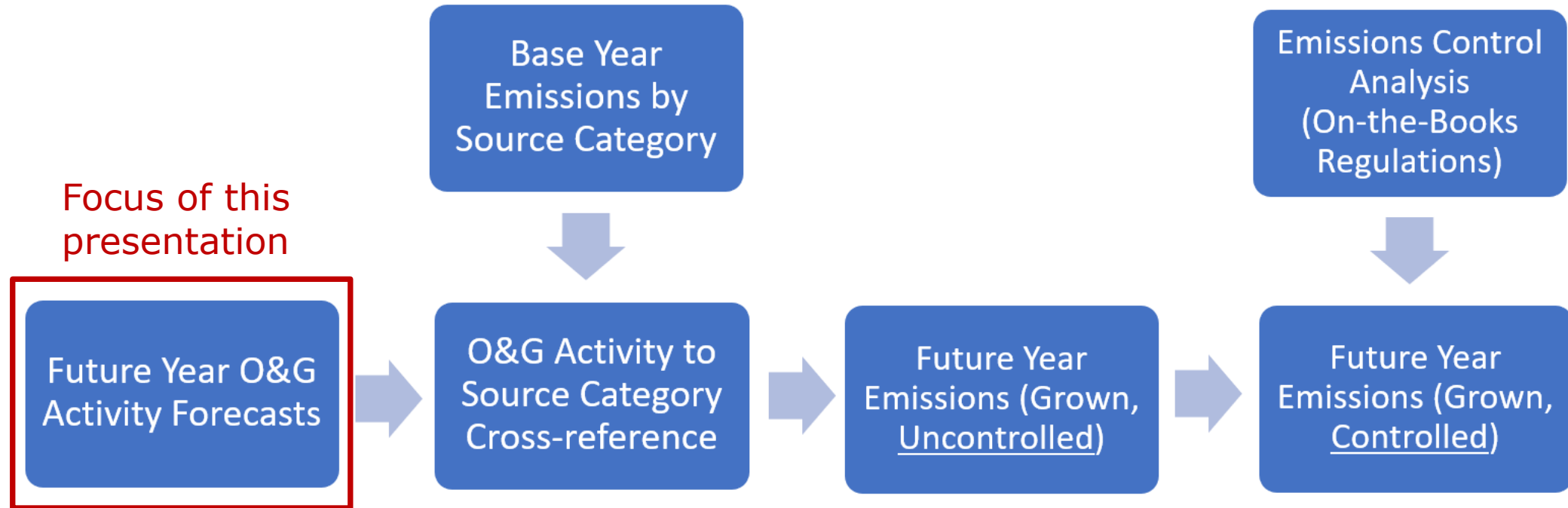
OUTLINE

- Overview of WRAP-region O&G activity forecasts developed by Ramboll
- Compare Ramboll's WRAP-region and Energy Information Administration (EIA) Annual Energy Outlook (AEO) O&G activity forecasts
- Request of EIA for further explanation

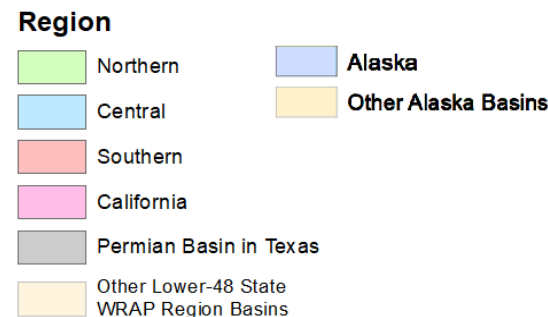
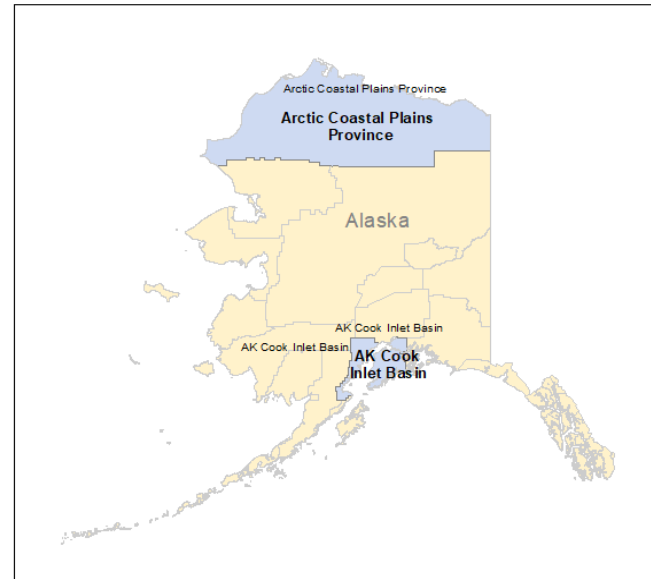
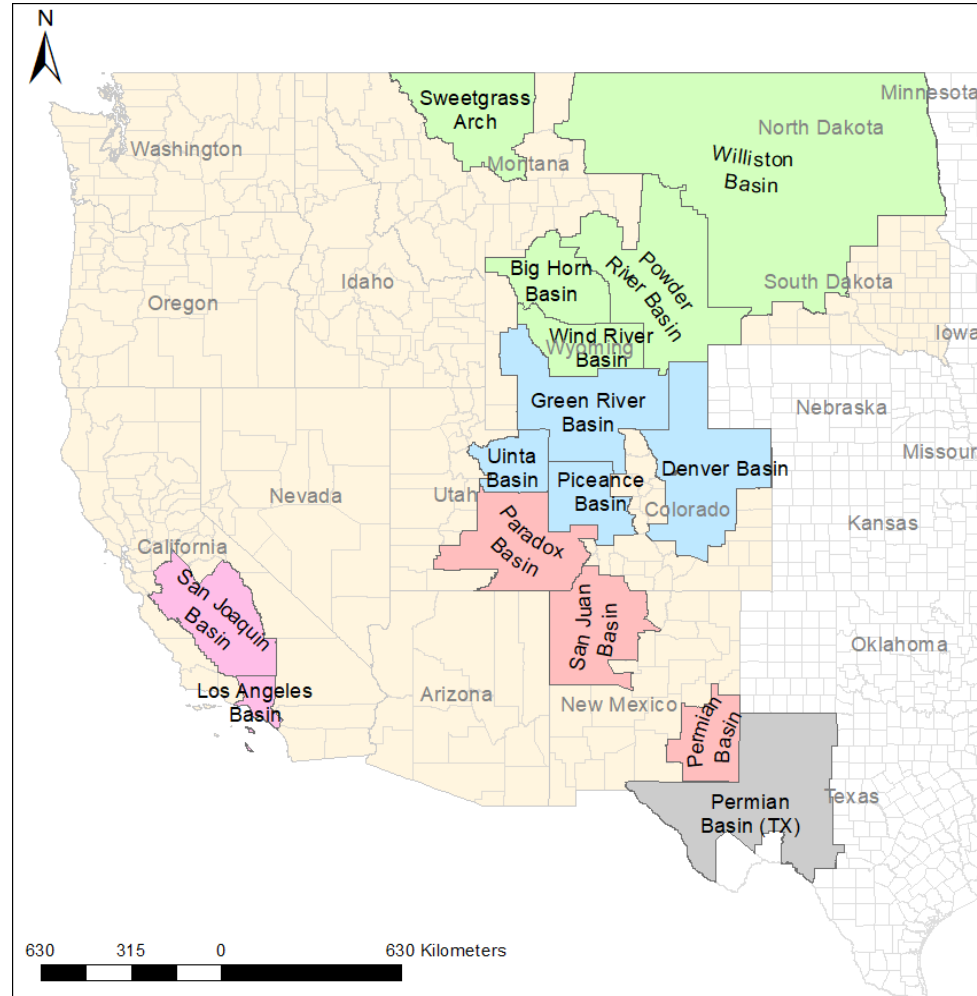
Additional details available in Ramboll's July 28, 2021 memorandum:

"O&G Activity Forecasts Developed for the Western Regional Air Partnership (WRAP) Region and Items for the Energy Information Administration (EIA) to Consider for the September National Oil and Gas (O&G) Emission Committee (NOGEC) Meeting Presentation"

TYPICAL FUTURE YEAR INVENTORY DEVELOPMENT PROCESS FOR THE O&G SECTOR

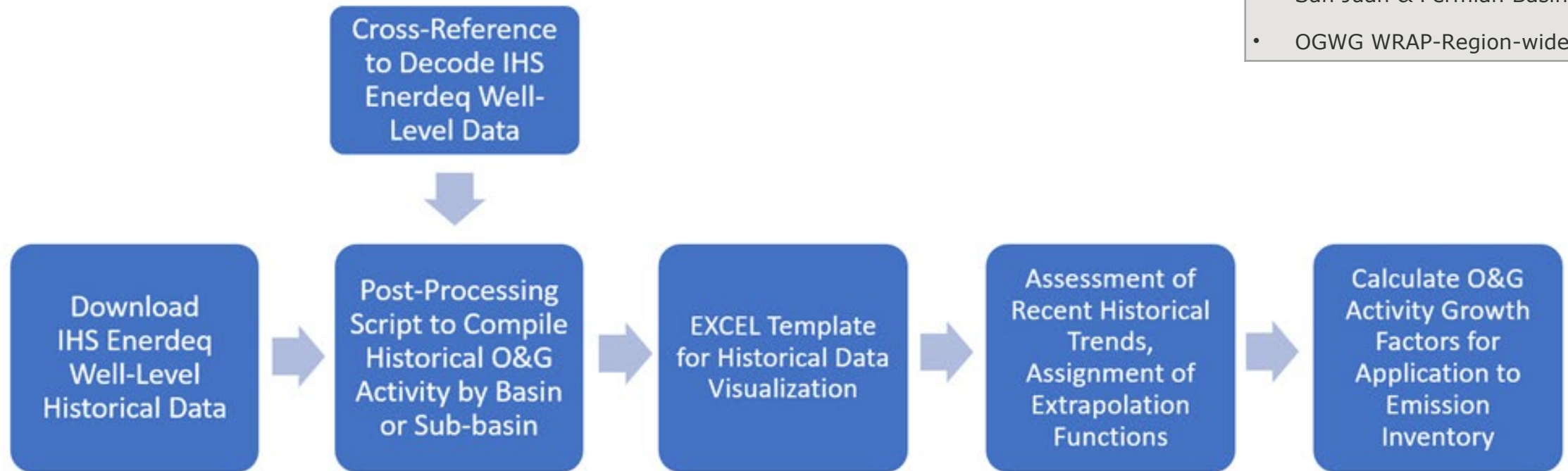


OIL & GAS WORK GROUP BASIN-LEVEL PROJECTIONS



- CDPHE developed Colorado forecast & CARB developed California forecast
- Leveraged official Agency forecasts for Alaska
- Ramboll developed historical trends forecasts with input from Agencies for other basins

WRAP STUDY PROCESS AND APPLICATIONS

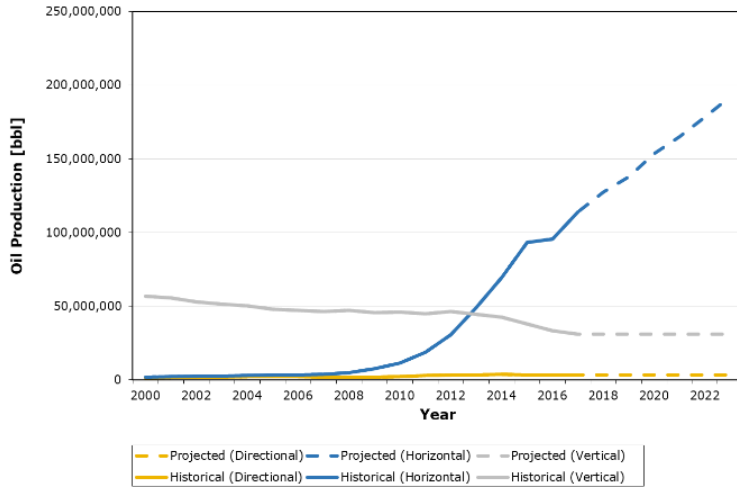


WRAP Projects with Future Year Forecasts

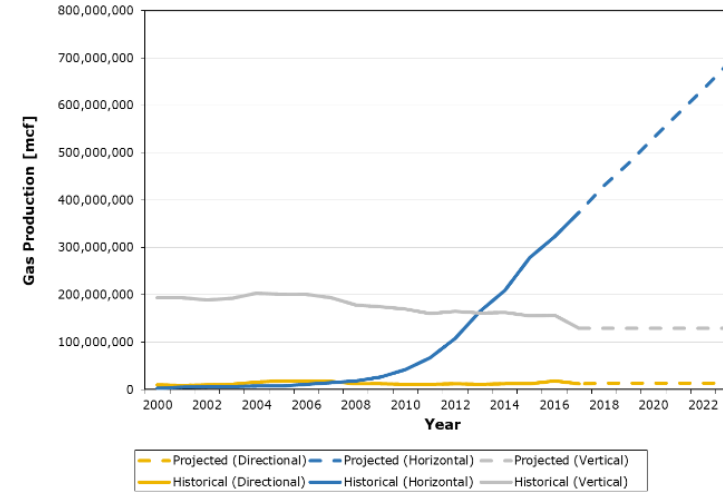
- Phase III
- IWDW-WAQS
- Williston & Great Plains Basins
- San Juan & Permian Basins
- OGWG WRAP-Region-wide

SAMPLE HISTORICAL TRENDS PROJECTIONS: PERMIAN BASIN

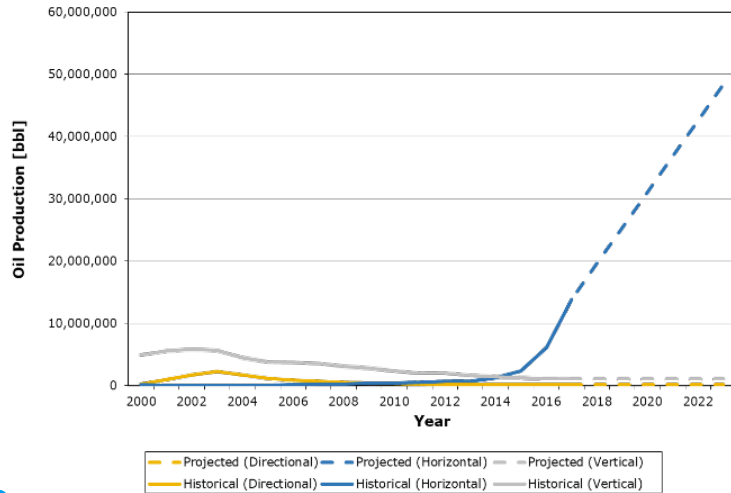
Oil Production - Permian Basin



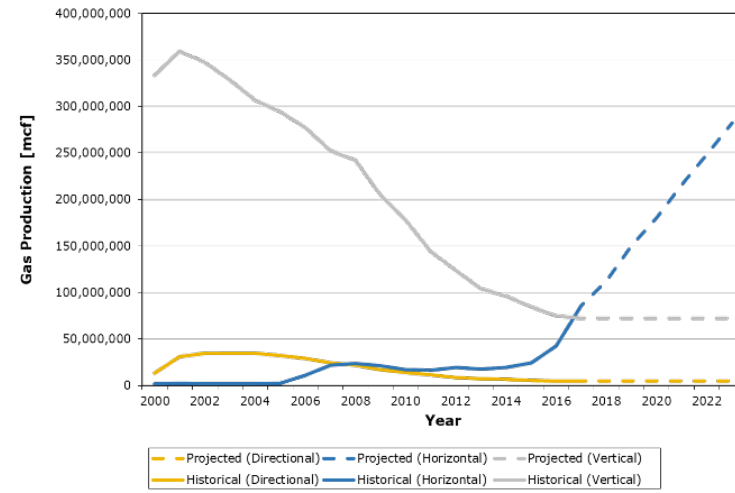
Associated Gas Production - Permian Basin



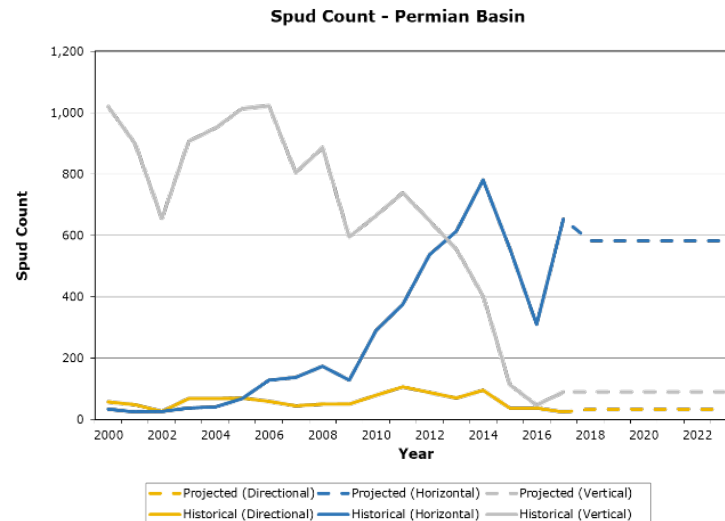
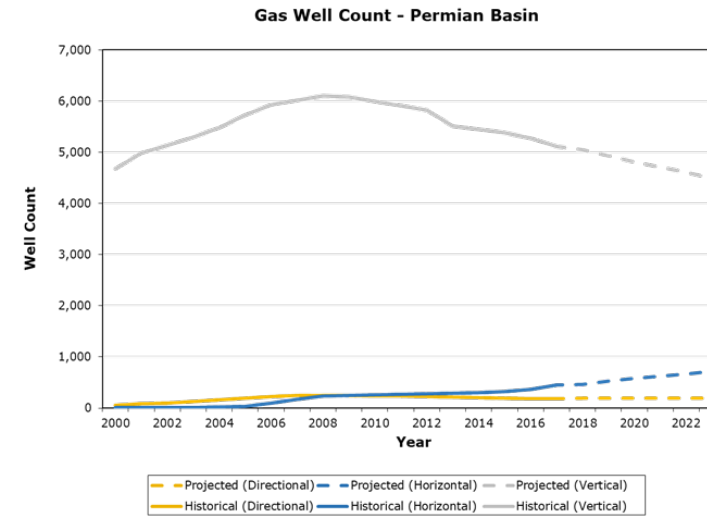
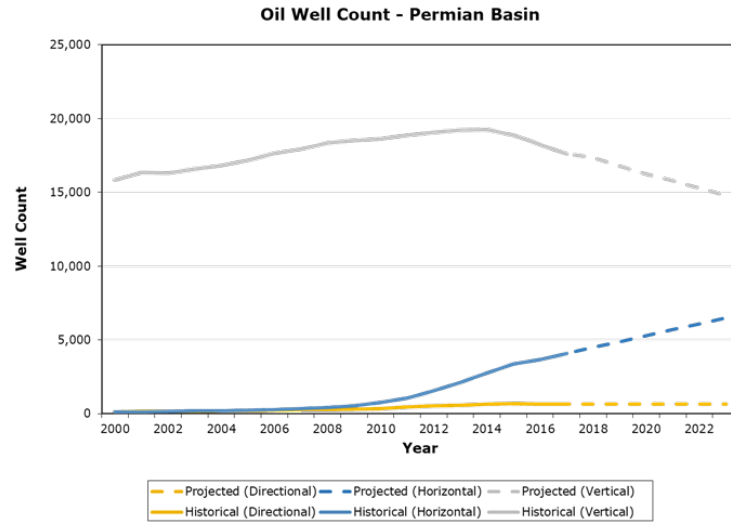
Condensate Production - Permian Basin



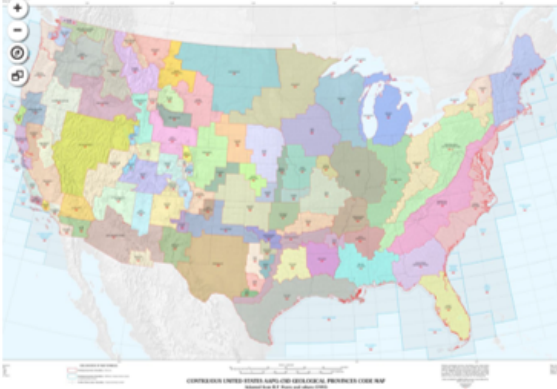

Primary Gas Production - Permian Basin



SAMPLE HISTORICAL TRENDS PROJECTIONS: PERMIAN BASIN



KEY DIFFERENCES BETWEEN WRAP AND EIA FORECASTS

Parameter	Historical Trends	EIA AEO
Purpose	To forecast emissions during specific time frames for use in air quality planning	"Outlook for energy markets through 2050" ¹¹
Forecast Basis	Recent historical trends	Economic evaluation and other factors ^{12,13}
Geographic region	Basin or sub-basin ¹⁴ 	Multi-state Oil and Gas Supply Module regions ¹⁵  <p>Source: U.S. Energy Information Administration, Office of Energy Analysis.</p>
Forecast Data Availability	Oil Wells <ul style="list-style-type: none"> • Oil production* • Associated gas production* • Active Oil Well Count* Gas Wells <ul style="list-style-type: none"> • Condensate production* • Primary gas production* • Active Gas Well Count* Coalbed Methane Wells <ul style="list-style-type: none"> • Natural gas production* • Active Gas Well Count* All Wells <ul style="list-style-type: none"> • Spud Count* 	<ul style="list-style-type: none"> • Oil production • Gas production

* O&G activity forecasts available with spud type detail (vertical, horizontal, directional) in recent WRAP OGWG forecasts

REQUEST FOR EIA

- At Sept. 9th National Oil & Gas Emission Committee (NOGEC) meeting, EIA should present one or more examples of basin-level AEO O&G activity forecasts and provide explanations on the topics/assumptions below.
 - Geographic resolution
 - Time-scales and uncertainty
 - Comparison of AEO method to historical trends method
 - Conventional/unconventional production accounting
 - Decline curves basis and granularity
 - Potential to provide additional parameters and resolution in AEO forecasts
 - O&G source controls / NEPA decision-making

END