

Life Cycle Analysis of Natural Gas Extraction and Power Generation: U.S. 2020 Emissions Profile Update

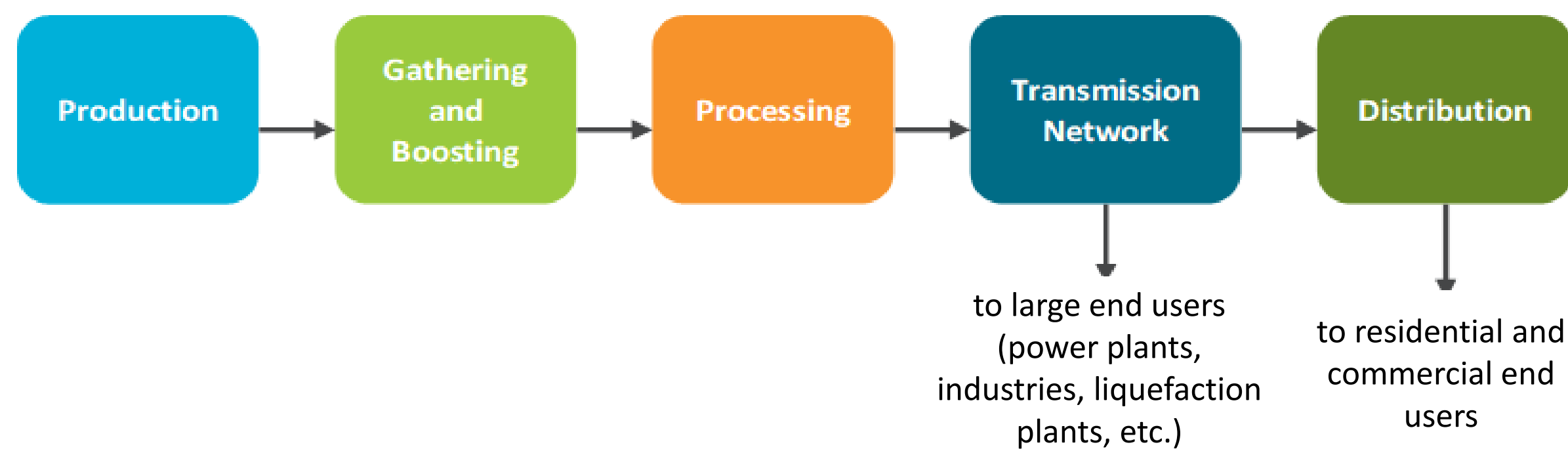
Research & Innovation Center



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Background of NETL NG Modeling

- Provides life cycle profiles by region and U.S. average
- Life cycle boundaries considered:
 - Production through Transmission Network – per 1 MJ of natural gas delivered directly to large end user (e.g., power plant, large industrial facility, etc.)
 - Production through Distribution Network – per 1 MJ of natural gas delivered to consumer (e.g., the consumer is a consumption-weighted mix of utility, industrial, commercial, and residential consumers)
 - Production through Power Production – per 1 MWh of electricity delivered to consumers

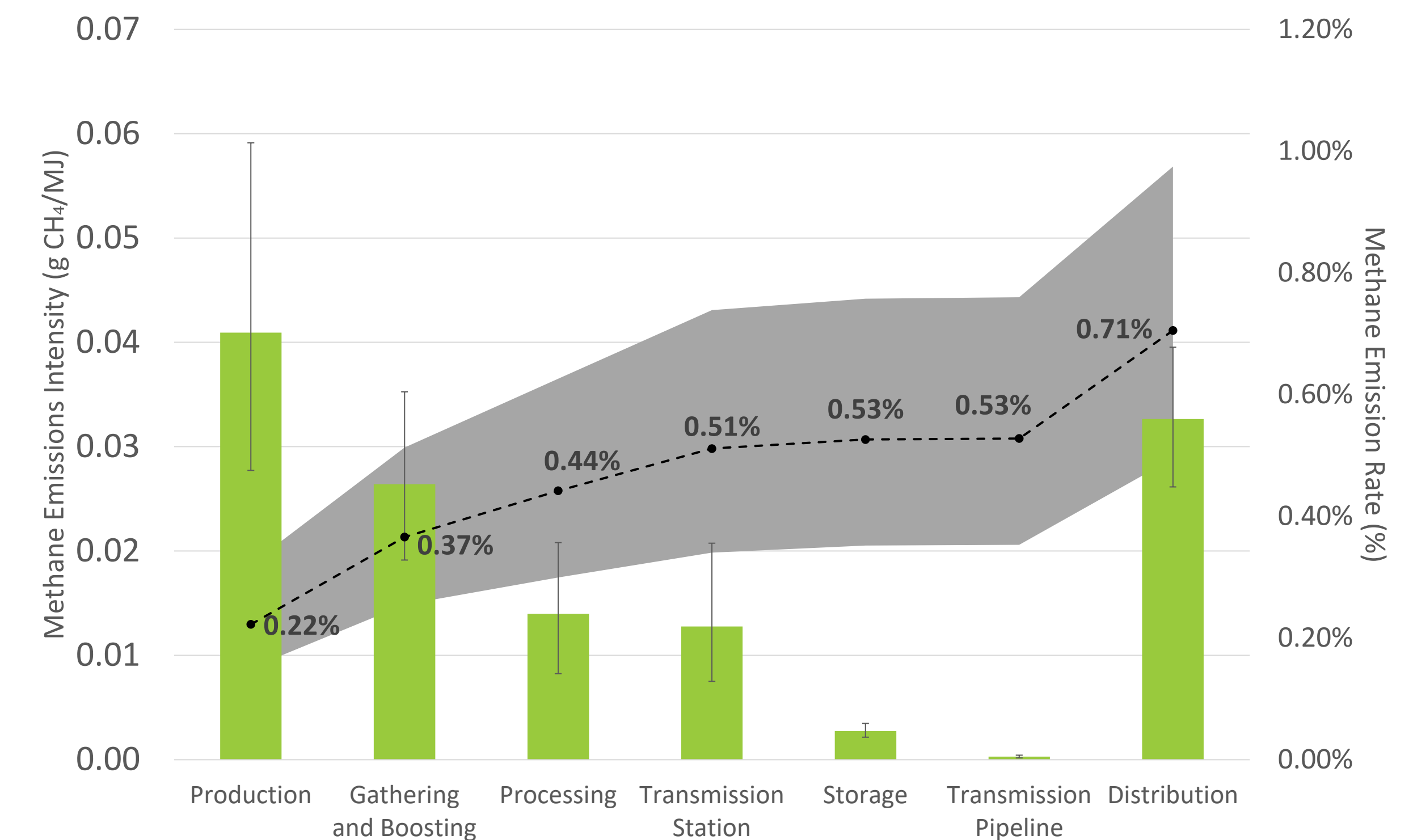
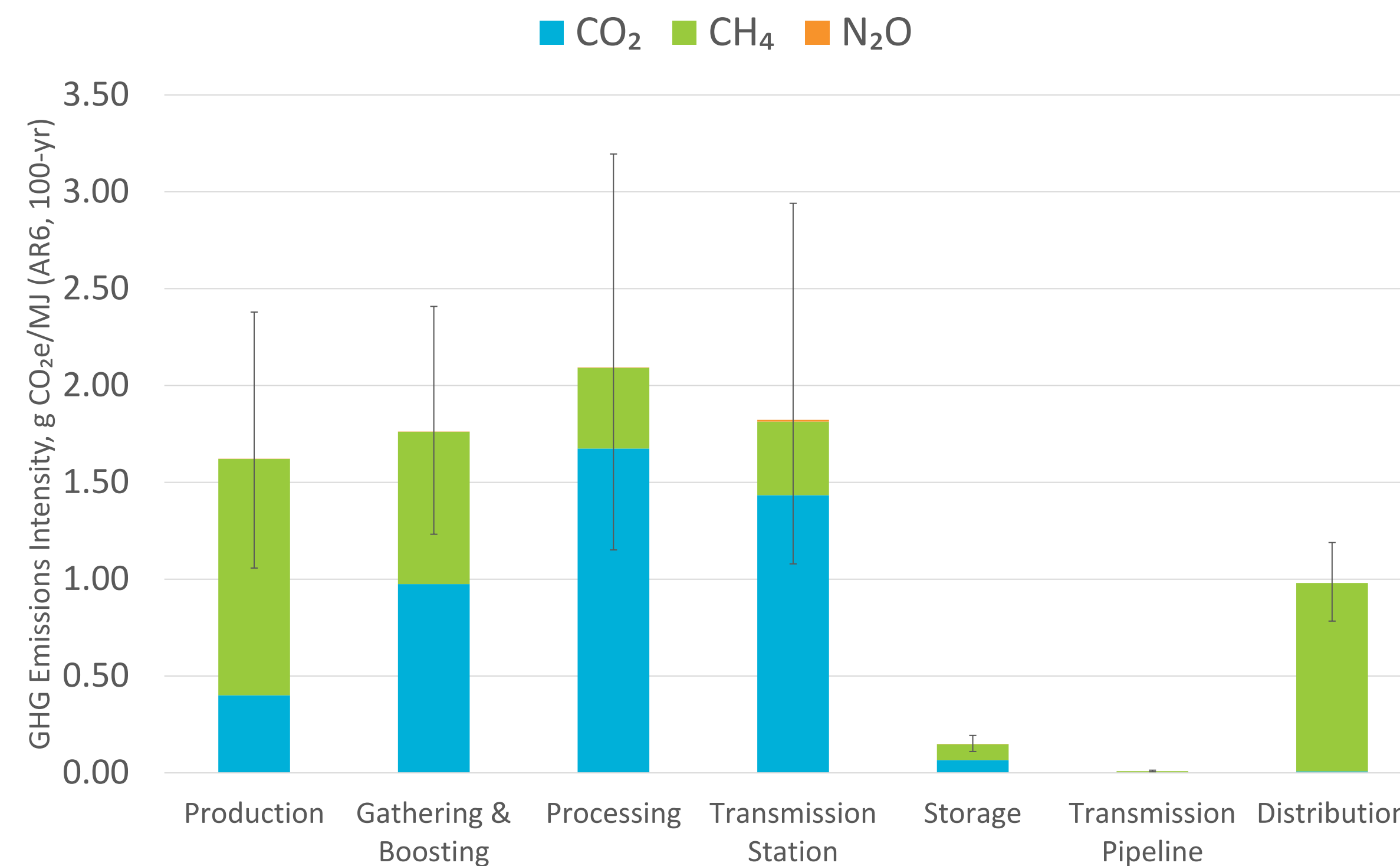


Supply chain stages that compose overall study boundary

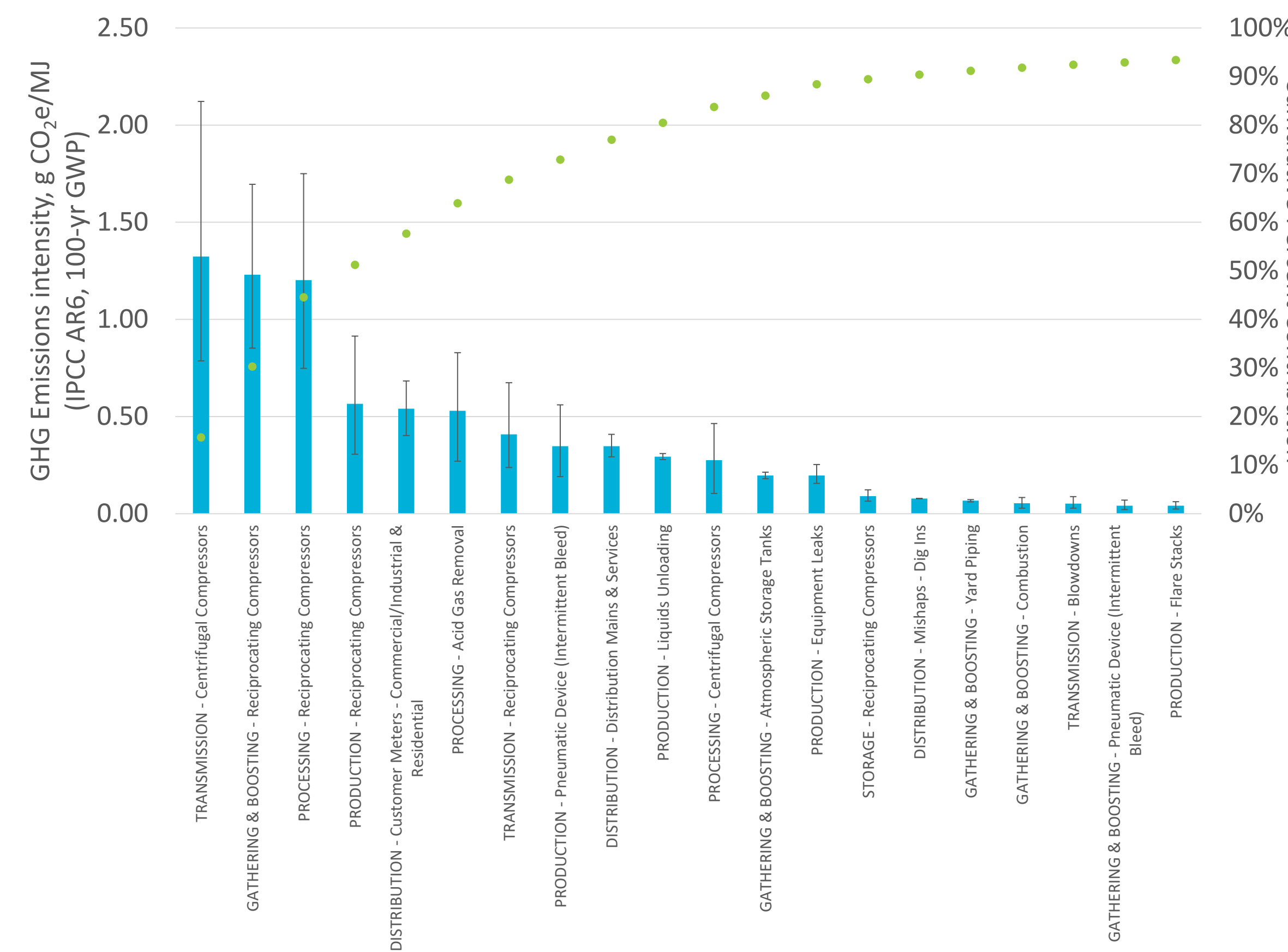
Modeling Updates/Changes

- Inclusion of measurement informed data
- Energy allocation of emissions between NG and NG supply chain co-products
- Regionalization of Processing stage data
- Regionalization of Transmission and Distribution stage data
- Updated bootstrapping methodology for compression energy estimation
- Updated associated gas production share modeling

Conclusions and Future Work



- National average life cycle GHG emissions from the NG supply chain are **8.4 g CO₂e/MJ** (with a 95% confidence interval of 5.4–12.3 g CO₂e/MJ)



- Top contributors : compressors (combustion exhaust and venting), pneumatic devices, liquids unloading, acid gas removal units, customer meters, etc.

- CH₄ emission rate** for the national average profile is **0.71%**, with 95% confidence interval ranging 0.50–0.98%

- Summary of techno-basin level life cycle GHG intensity results:

Highest: Uinta – conventional scenario (32.4 g CO₂e/MJ, with a 95% CI ranging 23.0-43.8 g CO₂e/MJ, IPCC AR6 100-year GWP)

Lowest: GoM – offshore scenario (6.7 g CO₂e/MJ, with a 95% CI ranging 4.9-8.9 g CO₂e/MJ, IPCC AR6 100-year GWP)

- Need to continue to assess the value of publicly available as well as measured data, and how their inclusion could affect results

Need to create better frameworks for comparative analysis of scenarios as model updates occur

Preliminary Results. Please do not cite.