

ENERGY FUTURES — INITIATIVE —

“Achieving a Net Zero Emissions Energy System by 2050”

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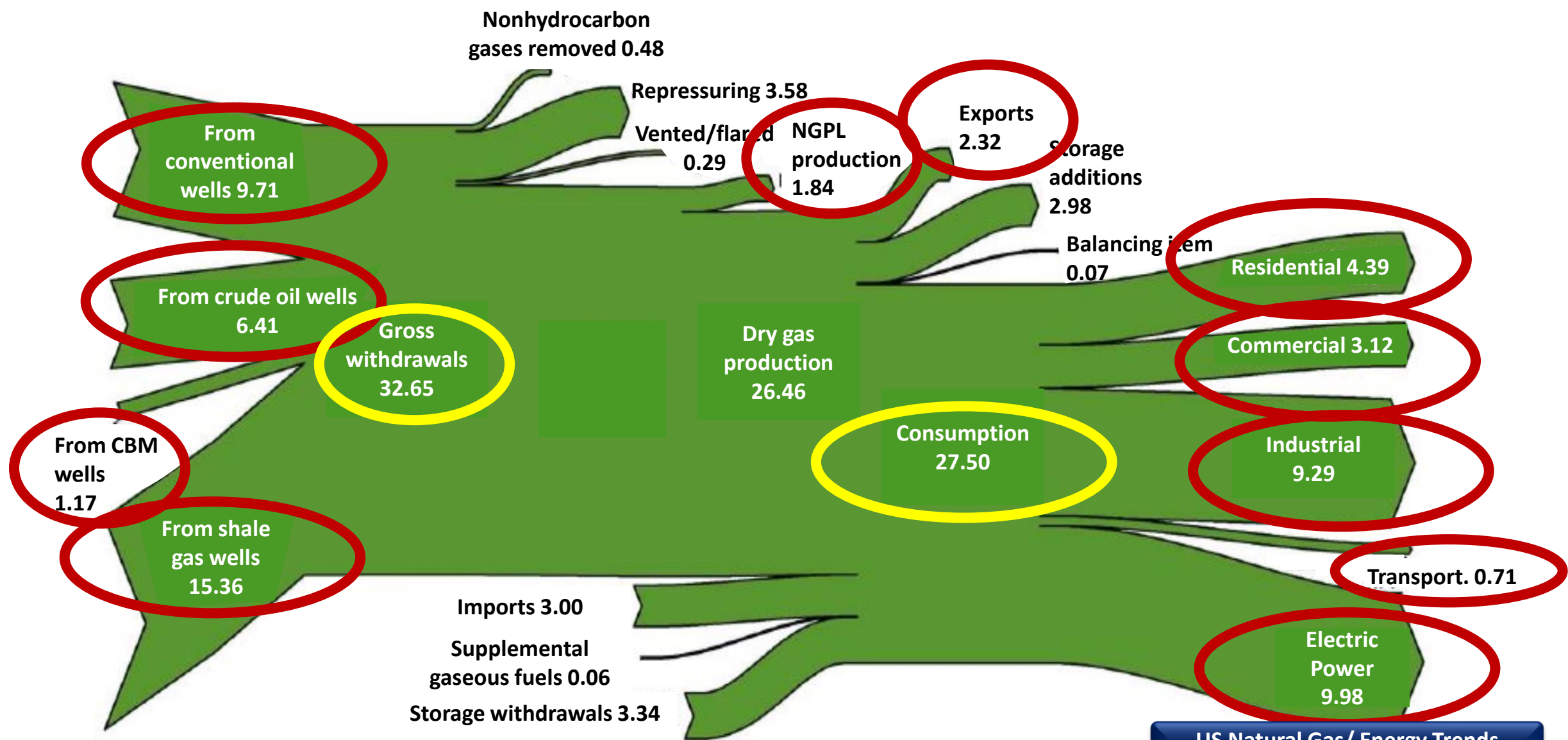
COP 24

Katowice, Poland

December 12, 2018



US Natural Gas Flows, 2016 (Tcf)

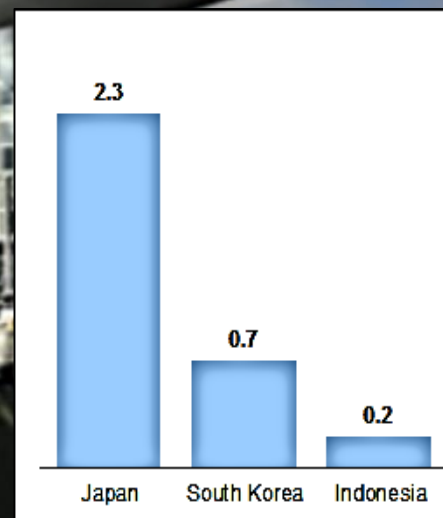




Significant Global LNG Volumes by 2020

“Only 23 of the existing 421 LNG vessel fleet could pass through the canal. Now, nearly 90% of all LNG vessels can pass through the canal....a typical trip from Sabine Pass to Japan is roughly 16,000 nautical miles without the canal and 9,133 nautical miles using the canal. That’s a saving of 42%..”

ADI Analytics



US LNG Volumes to Asia through Panama Canal by 2020 expected to exceed 3 bcf/d. EIA



Global Carbon Emissions, Key Countries/Regions/US

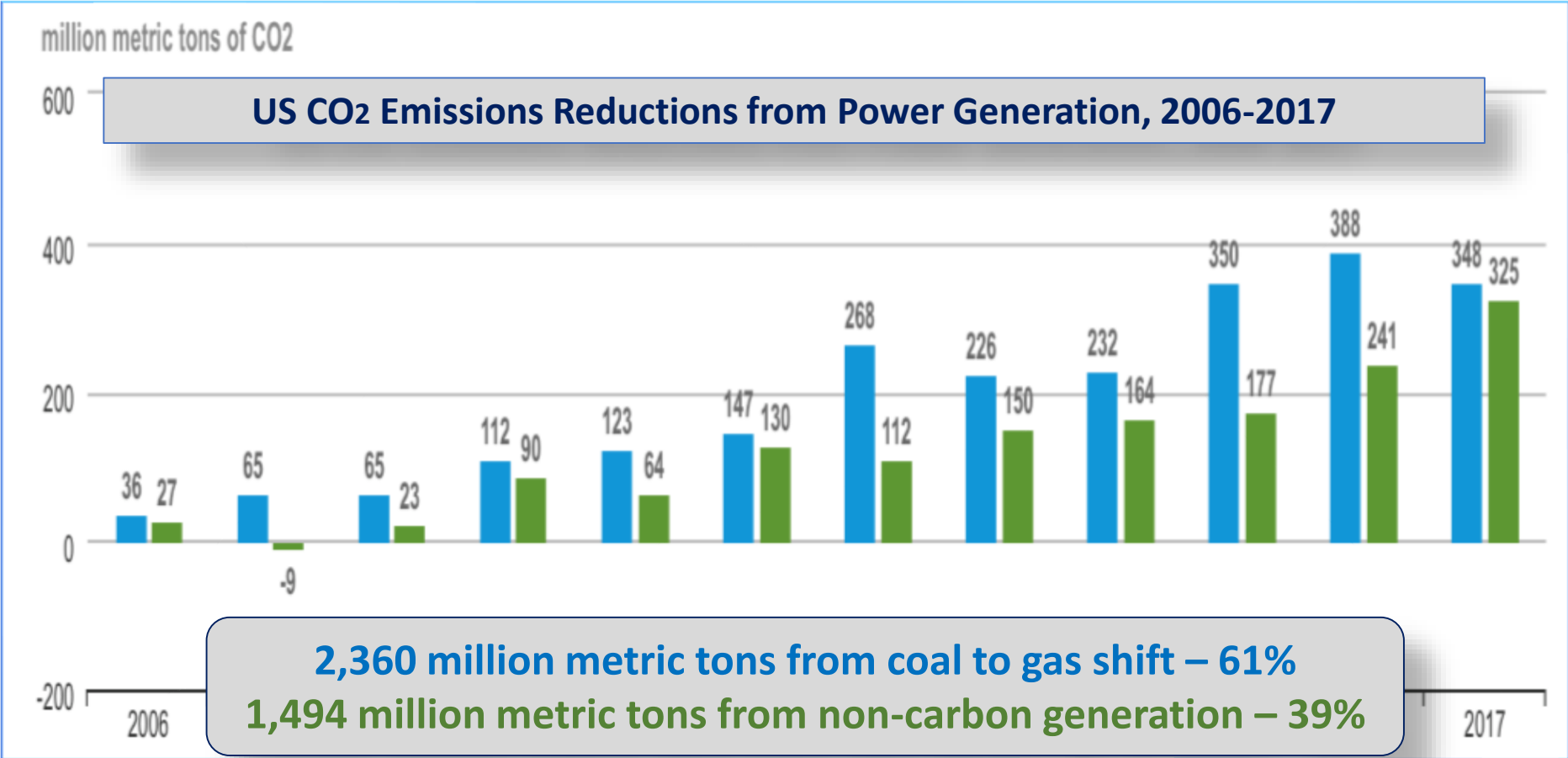


Reductions from coal to gas shift

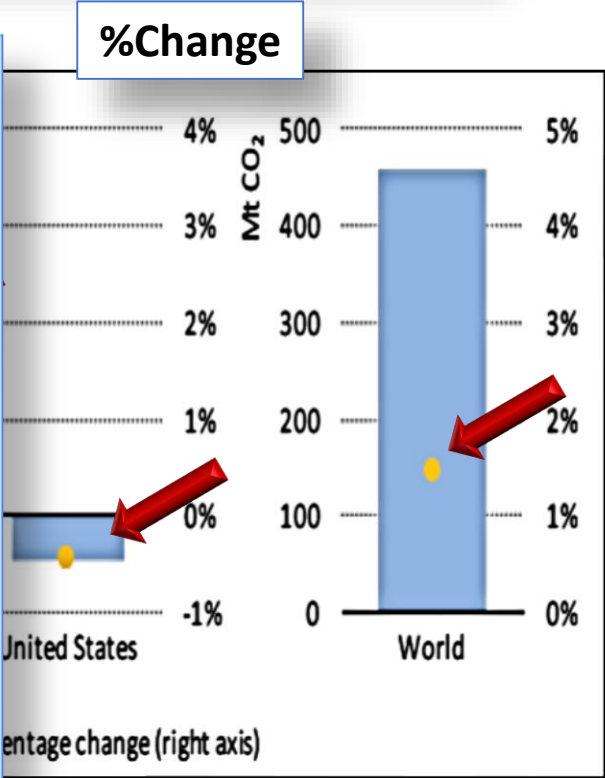


Reductions from non-carbon generation

Change in Energy-Related CO₂ Emissions, 2016-17



Source: EIA

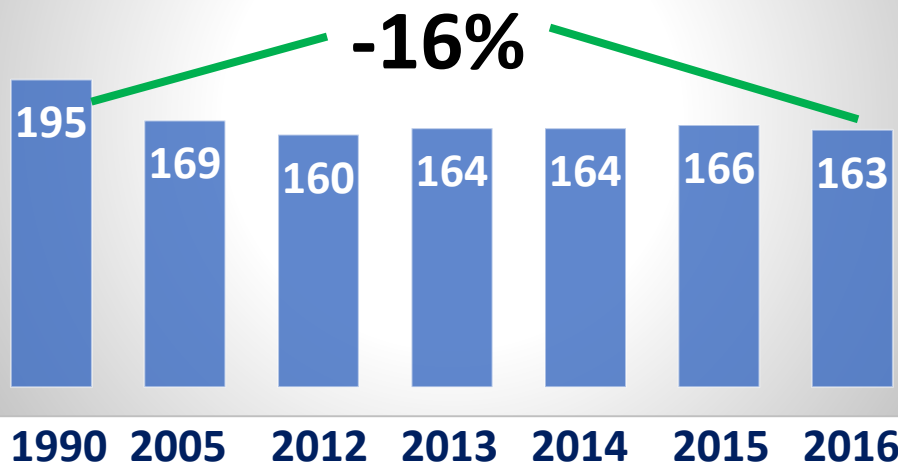


Source: IEA

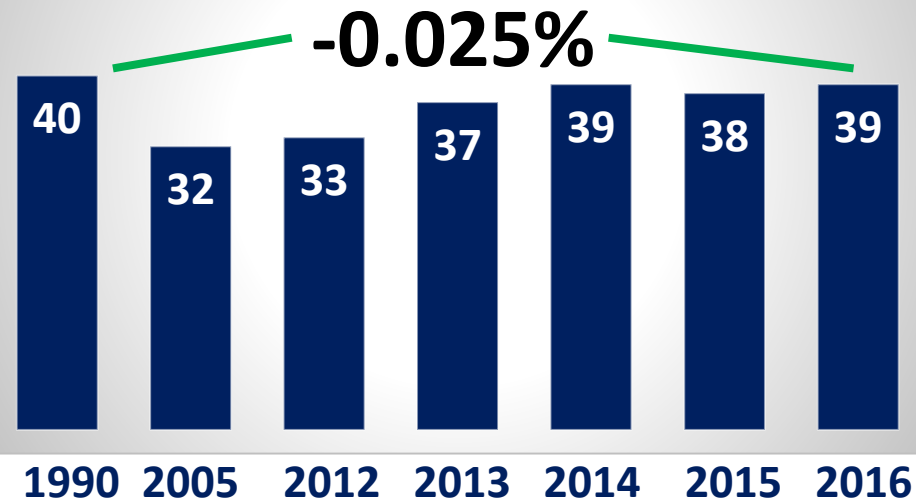


US Methane Emissions: Select Sources, Trends

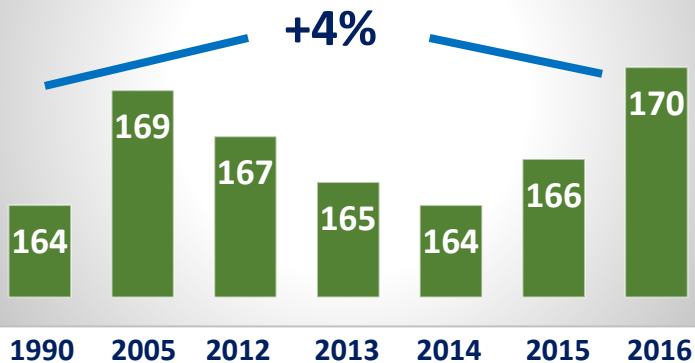
CH₄ Emissions from Gas Systems
(MMT CO₂e)



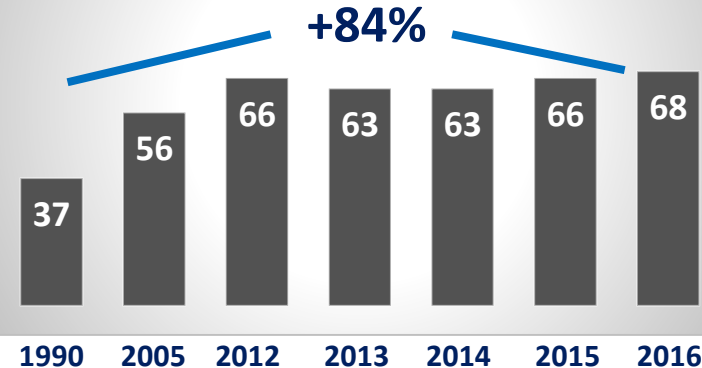
CH₄ Emissions from Petroleum
Systems (MMT CO₂e)



CH₄ Emissions from Enteric
Fermentation (MMT CO₂e)



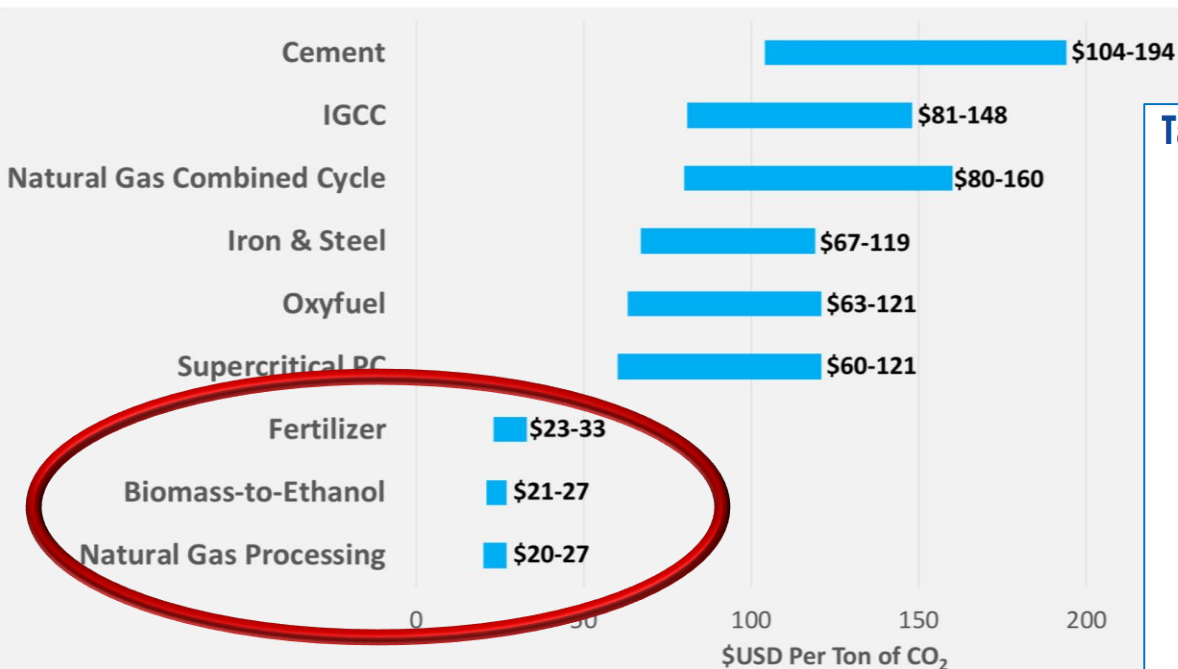
CH₄ Emissions from Manure
Management (MMT CO₂e)










Expanded 45Q Tax Credit for Carbon Capture, Utilization and Storage (CCUS)

Estimated and Measured First-of-a-Kind Costs for CCS Applied to Different Plants



Industry is the sector that is most difficult to decarbonize. Innovation is needed in hydrogen, carbon capture, storage and utilization, and biogas.

Tax Credit Value Available for Different Sources and Uses of CO₂

| Minimum Size of Eligible Carbon Capture Plant by Type (ktCO ₂ /yr) | | | | Relevant Level of Tax Credit in a Given Operational Year (\$USD/tCO ₂) | | | | | | | | | | |
|--|-------------|---------------------------|--------------------|---|------|------|------|------|------|------|------|------|-------------------|--|
|  | | | |  | | | | | | | | | | |
| Type of CO ₂ Storage/Use | Power Plant | Other Industrial Facility | Direct Air Capture | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | Beyond 2026 | |
|  Dedicated Geological Storage | 500 | 100 | 100 | 28 | 31 | 34 | 36 | 39 | 42 | 45 | 47 | 50 | Indexed Inflation | |
|  Storage via EOR | 500 | 100 | 100 | 17 | 19 | 22 | 24 | 26 | 28 | 31 | 33 | 35 | | |
|  Other Utilization Processes ¹ | 25 | 25 | 25 | 17 ² | 19 | 22 | 24 | 26 | 28 | 31 | 33 | 35 | | |

¹ Each CO₂ source cannot be greater than 500 ktCO₂/yr

² Any credit will only apply to the portion of the converted CO₂ that can be shown to reduce overall emissions