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Navigating the regulatory landscape: US environmental regulations pertaining to CO₂ emissions

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Abstract

Amid growing apprehensions regarding climate change, regulatory frameworks governing carbon dioxide emissions play a crucial role in shaping industrial practices, energy policies, and environmental sustainability efforts. Through an examination of key regulatory bodies, such as the Environmental Protection Agency (EPA) and relevant legislation such as the Clean Air Act, this paper analyzes the intricate web of regulations governing CO₂ emissions across various sectors. Additionally, the paper explores recent developments, including regulatory updates, policy shifts, and emerging trends, highlighting their implications for businesses, policymakers, and environmental advocates. By synthesizing complex regulatory information into a concise and accessible format, this paper aims to provide valuable insights for stakeholders navigating the dynamic landscape of US environmental regulations pertaining to CO₂ emissions.

Keywords: Sustainability; Climate Change; CO₂ Emissions; US Environmental Regulations

1. Introduction

In recent decades, the issue of climate change has become increasingly prominent, prompting governments worldwide to implement regulations aimed at reducing greenhouse gas emissions. In the United States, the oil and gas industry stand at the forefront of this regulatory scrutiny due to its significant contribution to CO₂ emissions. Understanding the regulatory framework surrounding CO₂ emissions is essential for both policymakers and industry stakeholders alike.

2. Overview of US Environmental Regulations

The regulation of CO₂ emissions in the United States is primarily governed by federal and state laws, as well as regulatory agencies such as the Environmental Protection Agency (EPA). The following are key regulations that directly impact the oil and gas industry:

Inflation Reduction Act (2022 45V): The Clean Hydrogen Production Tax Credit creates a new 10-year incentive for clean hydrogen of up to \$3.00/kilogram. The level of the credit provided is based on carbon intensity, up to a maximum of four kilograms of CO₂-equivalent per kilogram of H₂. The credit provides a varying, four-tier incentive depending on the carbon intensity of the hydrogen production pathway, and whether the project meets prevailing wage and apprenticeship requirements.

Methane Regulations: Methane, a potent greenhouse gas, is often released during oil and gas production processes. In 2016, the EPA introduced regulations to control methane emissions from new and modified oil and gas facilities.

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However, these regulations were rolled back by the Trump administration and are currently under review by the Biden administration.

Clean Power Plan (CPP): Introduced in 2015, the CPP aimed to reduce CO₂ emissions from the power sector by setting state-specific emission reduction goals. While the CPP primarily targeted power plants, its implementation would have indirectly impacted the oil and gas industry by promoting the adoption of cleaner energy sources.

Greenhouse Gas Reporting Program: Established in 2009, this program requires large emitters, including oil and gas facilities, to report their greenhouse gas emissions to the EPA annually. This data is crucial for tracking emissions trends and formulating targeted regulatory strategies.

Clean Air Act (CAA): Enacted in 1970 and subsequently amended, the Clean Air Act is the cornerstone of US air pollution control efforts. Under the CAA, the EPA has authority to regulate emissions of criteria pollutants, including CO₂. The regulation of greenhouse gases, including CO₂, as pollutants under the CAA was affirmed by the Supreme Court in the landmark case *Massachusetts v. EPA* (2007).

Greenhouse Gas Reporting Program (GHGRP) (40 CFR 98) (EPA n.d.): The GHGRP, outlined in 40 CFR 98, mandates reporting from owners or operators of onshore petroleum and natural gas production wells and associated equipment. Under Subpart W, emissions from all wells within each hydrocarbon basin owned or operated by a single entity are combined for reporting. Additionally, emissions from both stationary and portable fuel combustion equipment fall under Subpart W of the GHGRP.

National Ambient Air Quality Standards (NAAQS) (40 CFR 50) (EPA n.d.): These regulations, established by the EPA, set primary and secondary NAAQS levels essential for safeguarding public health and welfare. They define the necessary air quality levels to maintain and protect the environment and public health.

New Source Performance Standards (NSPS) (40 CFR 60) (EPA n.d.): The EPA issues NSPS, detailed in 40 CFR 60, to set air pollution emission standards for newly established stationary sources of emissions. NSPS are applicable across various sectors related to energy development, including oil and gas production facilities, natural gas processing plants, and petroleum refineries. In 2016, the EPA updated the NSPS to target methane, volatile organic compounds (VOCs), and air toxics emissions. Amendments to the policy were made in the Fall of 2019 to enhance regulatory effectiveness.

National Emission Standards for Hazardous Air Pollutants (NESHAPs) Regulations (40 CFR 63) (EPA n.d.): These regulations, outlined in 40 CFR 63, are established by the EPA to govern emissions of hazardous air pollutants (HAPs) or air toxics not covered by the NAAQS. NESHAPs set standards for various "source categories" emitting significant quantities of HAPs, including categories associated with energy development activities. These standards are critical for minimizing public exposure to harmful air pollutants and ensuring environmental protection.

33 U.S.C. §2701 et seq. (1990)

The Oil Pollution Act (OPA) of 1990 streamlined and strengthened EPA's ability to prevent and respond to catastrophic oil spills. A trust fund financed by a tax on oil is available to clean up spills when the responsible party is incapable or unwilling to do so. The OPA requires oil storage facilities and vessels to submit to the Federal government plans detailing how they will respond to large discharges. EPA has published regulations for aboveground storage facilities; the Coast Guard has done so for oil tankers. The OPA also requires the development of Area Contingency Plans to prepare and plan for oil spill response on a regional scale.

42 U.S.C. §13101 et seq. (1990)

The Pollution Prevention Act focused industry, government, and public attention on reducing the amount of pollution through cost-effective changes in production, operation, and raw materials use. Opportunities for source reduction are often not realized because of existing regulations, and the industrial resources required for compliance, focus on treatment and disposal.

Source reduction:

- is fundamentally different and more desirable than waste management or pollution control
- refers to practices that reduce hazardous substances from being released into the environment prior to recycling, treatment or disposal

- includes equipment or technology modifications, process or procedure modifications, reformulation or redesign of products, substitution of raw materials, and improvements in housekeeping, maintenance, training, or inventory control.

Pollution prevention includes practices that increase efficiency in the use of energy, water, or other natural resources, and protect our resource base through conservation.

33 U.S.C. §2601 et seq. (1988)

Title IV of the Ocean Dumping Ban Act of 1988 created the Shore Protection Act of 1988 (SPA), which prohibits the transportation of municipal or commercial waste within coastal waters by a vessel without a permit and number or other marking. Permits are not to run beyond renewable five-year terms and will terminate when the vessel is sold. EPA, in consultation with the U.S. Coast Guard, is responsible for developing regulations governing the loading, securing, offloading, and cleaning up of such wastes from waste sources, reception facilities, and vessels. The goals of the regulations are to minimize deposit of waste into coastal waters during vessel loading, transport, and unloading, and to ensure that any deposited waste is reported and cleaned up.

33 U.S.C. §1251 et seq. (1972)

The Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. The basis of the CWA was enacted in 1948 and was called the Federal Water Pollution Control Act, but the Act was significantly reorganized and expanded in 1972. "Clean Water Act" became the Act's common name with amendments in 1972.

Under the CWA, EPA has implemented pollution control programs such as setting wastewater standards for industry. EPA has also developed national water quality criteria recommendations for pollutants in surface waters.

The CWA made it unlawful to discharge any pollutant from a point source into navigable waters, unless a permit was obtained:

- EPA's National Pollutant Discharge Elimination System (NPDES) permit program controls discharges.
- Point sources are discrete conveyances such as pipes or man-made ditches.
 - Individual homes that are connected to a municipal system, use a septic system, or do not have a surface discharge do not need a NPDES permit;
 - Industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters.

3. Impact on the Oil and Gas Industry

The stringent environmental regulations pertaining to CO₂ emissions have significant implications for the oil and gas industry:

- **Compliance Costs:** Meeting regulatory requirements often necessitates investment in new technologies and infrastructure to reduce emissions. These compliance costs can pose financial challenges for oil and gas companies, particularly smaller operators.
- **Operational Constraints:** Regulatory compliance may require changes to operational practices, such as implementing emissions monitoring systems or adopting cleaner production techniques. These changes can impact the efficiency and profitability of oil and gas operations.
- **Market Dynamics:** Increasing regulatory scrutiny of CO₂ emissions is driving demand for cleaner energy alternatives, such as renewable fuels and natural gas. This shift in market dynamics poses both challenges and opportunities for the oil and gas industry, prompting companies to diversify their energy portfolios.

The oil and gas industry is a significant contributor to greenhouse gas (GHG) emissions, which are a major driver of climate change. In response, the United States has implemented various environmental regulations as discussed above aimed at reducing emissions from this sector. The effectiveness of these regulations has a direct impact on GHG emissions in the oil and gas industry.

Regulatory Framework: As discussed above the regulatory framework governing GHG emissions in the US oil and gas industry is multifaceted. Key regulations include emissions standards set by the Environmental Protection Agency (EPA), methane regulations targeting leakage and flaring, and renewable fuel mandates promoting the use of cleaner alternatives.

Effectiveness of Regulations: Evaluating the effectiveness of these regulations requires examining their impact on GHG emissions. Studies have shown mixed results, with some regulations leading to significant reductions in emissions, while others have faced challenges due to loopholes or inadequate enforcement. For example, the EPA's emissions standards for vehicles and industrial sources have helped curb GHG emissions, but methane regulations have faced implementation challenges, particularly in monitoring and enforcement.

Technological Advancements: Advancements in technology have played a crucial role in reducing GHG emissions in the oil and gas industry. Innovations such as methane detection technologies, carbon capture and storage (CCS), and renewable energy integration have offered opportunities for emission reductions beyond regulatory requirements. However, the pace of technological adoption varies across the industry, impacting the overall effectiveness of emissions reduction efforts.

Industry Compliance and Challenges: Achieving emissions reductions in the oil and gas industry relies heavily on industry compliance with regulations. While many companies have taken proactive steps to reduce their environmental footprint, others have faced challenges in implementing costly mitigation measures. Additionally, regulatory uncertainty and policy fluctuations can hinder long-term planning and investment in emission reduction initiatives.

Global Implications: The impact of US environmental regulations on GHG emissions in the oil and gas industry extends beyond domestic borders. As a major player in the global energy market, US regulatory policies influence international norms and standards. Efforts to reduce emissions domestically can also set an example for other countries and facilitate global cooperation on climate action.

4. Conclusion

US environmental regulations play a crucial role in shaping GHG emissions in the oil and gas industry. While these regulations have contributed to emission reductions, their effectiveness is influenced by various factors such as technological advancements, industry compliance, and global dynamics. Moving forward, continued evaluation, innovation, and collaboration will be essential for achieving meaningful emissions reductions and addressing the challenges of climate change in the oil and gas sector.

Moreover, as concerns about climate change continue to grow, the regulation of CO₂ emissions in the United States is likely to become even more stringent in the years ahead. For the oil and gas industry, navigating this regulatory landscape will require a proactive approach that balances environmental responsibilities with operational realities. By embracing innovation and sustainability, the industry can mitigate its environmental impact while remaining competitive in a rapidly evolving energy landscape.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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