

GLOBAL PROSPECTS OF CO₂ EMISSIONS IN POWER GENERATION AND THE CARBON MITIGATION ROLE OF NATURAL GAS

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Overview

This communication aims to highlight the future development of CO₂ emissions in the power sector, which has emerged as major driver of the ongoing transformation towards less carbon-intensive energy systems. Power sector is observing important changes, with increasing role of electricity in the final energy consumption, as well as penetration of cleaner energy sources for power generation, including natural gas and intermittent renewables. These observed developments in power sector are supported by technology progress and policies, particularly the CO₂ mitigation policies, which are adopted by countries to comply with their Paris Agreement commitments and pledges. In this paper, we will also analyse the role and advantages of gas for power in reducing emissions, while in the same time achieving competitiveness and sustainability.

Methods

This communication is structured in three parts: the first part will assess the recent trends of CO₂ emissions, highlighting the role of power generation sector in driving the emissions momentum. We especially analyse the recent switching dynamics between gas and coal observed in some key markets, as well as its effect in terms of carbon mitigation.

The second part will examine the developments and prospects of power sector, including electricity demand perspectives and the future power generation mix in different regions, basing on the Power Module of the GECF Global Gas Model. We will highlight the main determinants affecting these prospects, specifically the costs of generating power as well as the policies adopted in key markets.

In the third part, we will highlight CO₂ emissions perspectives from power generation as well as the future role of gas- power plants in mitigating these emissions.

Results

Power generation sector will contribute significantly in slowing down global CO₂ emissions over the long term. However, large disparities in the power-related emissions are expected, especially between OECD and Non OECD countries. These disparities are driven by various electricity demand prospects and also by different options and choices adopted for electricity production.

Non OECD Asia will see larger increase in its power-related CO₂ emissions compared to other regions, which is due to the need to satisfy huge expected rise of electricity demand as well as large reliance on coal in many Asian countries.

Despite significant policy support and decreasing investment costs for renewables, the competitiveness of this source of energy in producing power remain sensitive to some key uncertainties, including renewables capacity factors, as well as the cost of integrating renewables in power systems and providing back-up for their intermittency.

Natural gas will observe increasing role in power generation in many regions, supported by its economic, environmental and technical advantages. The penetration of natural gas against coal will be an important contributor in mitigating CO₂ emissions, particularly in countries initiating aggressive policies to reduce the share of coal like China or other European countries announcing decommissioning of coal-power plants

Conclusions

Power generation sector is expected to be at the forefront of the CO₂ mitigation efforts, This sector has large potential of emission mitigation, that can be tapped through various options including the switching to less carbon-intensive hydrocarbon sources for producing power, improving energy efficiency of power plants or supporting the development of renewables.

Natural gas could be an optimal CO₂ mitigation option for power generation because it allows to reduce the emissions in competitive and sustainable ways. Increasing the penetration of natural gas against coal in power has a large potential to reduce carbon intensity and other environmental externalities such as local air pollution in many countries. Natural gas can also contribute in improving energy efficiency given the energy performance of gas power plants (e.g. Combined Cycles) as well as the possibility to combine efficiently the gas-based power generation with heat production or water desalination. Moreover, natural gas can be a good response to the rising requirements for more flexible power systems due to the increase of intermittent renewables.

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