

Low Carbon Technology Options for Natural Gas Electricity Production

Gurbakhash Bhandar, Chun-Wai Lee, Matthew Hakos, Jeffrey Coburn, Christopher Hoeger, and (contact from NetPower)

Natural gas-fired electricity generation offers several advantages over conventional coal-fired electricity generation. Two key advantages include lower pollutant emissions and higher energy efficiencies. As a result of shale gas development through hydraulic fracturing, there has been a significant increase in natural gas availability and a reduction in natural gas costs, so there are also economic incentives to use natural gas for electricity generation. Although natural gas combined cycle (NGCC) electricity production can reduce greenhouse gas (GHG) emissions through energy efficiency improvements, NGCC units are not well-suited for further GHG emission reductions through conventional carbon capture technologies due to the large amounts of excess air commonly used in conventional NGCC turbines, which leads to low carbon dioxide (CO₂) concentrations in the exhaust gas. This paper evaluates two innovative processes for natural gas electricity generation that allow for high energy efficiencies and high carbon capture efficiencies. The processes are described and the economic and environmental impacts (focusing on GHG emission impacts) associated with these alternative electricity production options are presented and compared with NGCC plants and NGCC plants that employ conventional CO₂ scrubbing technologies.