Abstract

The past decade witnessed breakthroughs in the extraction of shale and other unconventional natural gas sources, substantially increasing the estimated low-cost supply of natural gas in North America, particularly in the United States. This thesis is an empirical investigation of whether, and to what extent, a falling cost of plentiful natural gas is a benefit or a problem for fighting climate change by exploring the implications of abundant gas on various aspects of climate policy. On the one hand, natural gas is less-emissions intensive than coal and conventional crude oil, and so substitution to natural gas from these sources can potentially serve as a mitigation tool. On the other hand, lower cost gas is only a partial de-carbonization relative to near-zero Greenhouse Gas (GHG) technologies like nuclear, carbon capture and storage, and renewable energy. I examined these and other considerations regarding natural gas’ interplay with climate policy using the CIMS hybrid energy-economy model. Some key focus areas included:

- What are the near-term implications of abundant gas on GHG emissions?
- What are the implications over a longer period of energy transition, such as to 2050?
- How might abundant gas play a key role in specific sectors?
- What impact might abundant gas have on a staged implementation of policy, with differing levels of policy stringency by sector?

Some key findings concerning the gas revolution’s interplay with climate policy are that:

- Abundant natural gas results in slight reductions in near-term emissions relative to scarce gas scenarios, although near-term reductions for the power sector are significant.
- Abundant natural gas makes it harder to achieve deep de-carbonization by 2050 relative to scenarios with scarce gas.
- Abundant natural gas worsens emissions leakage from the power sector to end use sectors when the former is subject to stringent carbon policy while the latter is not.
- Abundant natural gas may make it easier to achieve emissions reductions in sectors such as heavy trucking, provided it is coupled with certain complementary technologies and fuels like renewable natural gas; and
- Abundant natural gas, combined with unanticipated policy, can achieve deep de-carbonization by 2050. However, realizing this outcome necessitates higher carbon prices as the unanticipated policy creates lock-in of natural gas in some sectors.
Keywords: Abundant Natural Gas; Energy-Economy Modelling; Climate Policy; Power Sector; Freight Transport