WORLD NATURAL GAS ENDOWMENT AS A BRIDGE TOWARDS ZERO CARBON EMISSIONS

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Overview

As the world economy continues to expand over the long term, natural gas has the potential to play a significant role in satisfying energy demand and acting as a bridge towards renewables. Increased use of gas will help to reduce dependency on oil and coal, which may result in increased energy security and reduced environmental impact. Thus, the aim of this study is to analyze the role of natural gas, on a global scale, in providing a sustainable global energy future. In particular, we provide projections related to natural gas and its association to the energy mix, decarbonization, and CO_2 emissions.

Methods

A global energy market (GEM) model is used to show that natural gas has the potential to help stabilize global CO_2 emissions in a span of about 50-100 years and pave the way towards low and zero carbon energy. The GEM model is based on a previous logistic substitution model that provided a good match of the energy mix from approximately 1850 to 1970. After 1970, the actual historical data deviated from the logistic model. The GEM model takes this deviation into account while providing a good fit of all the historical data. It also matches historical carbon production and CO_2 emissions generated by the combustion of fossil fuels. The model is then used to forecast the future energy mix, as well as the carbon and CO_2 emissions, up to the year 2150.

Expected Results

The GEM projection shown in Figure 1 indicates that the share of natural gas in the energy mix will increase by 2030. However, progress in the natural gas industry will not occur autonomously over time. The effects of energy policy and technology advancement will be critical to develop the large conventional and unconventional natural gas endowment.
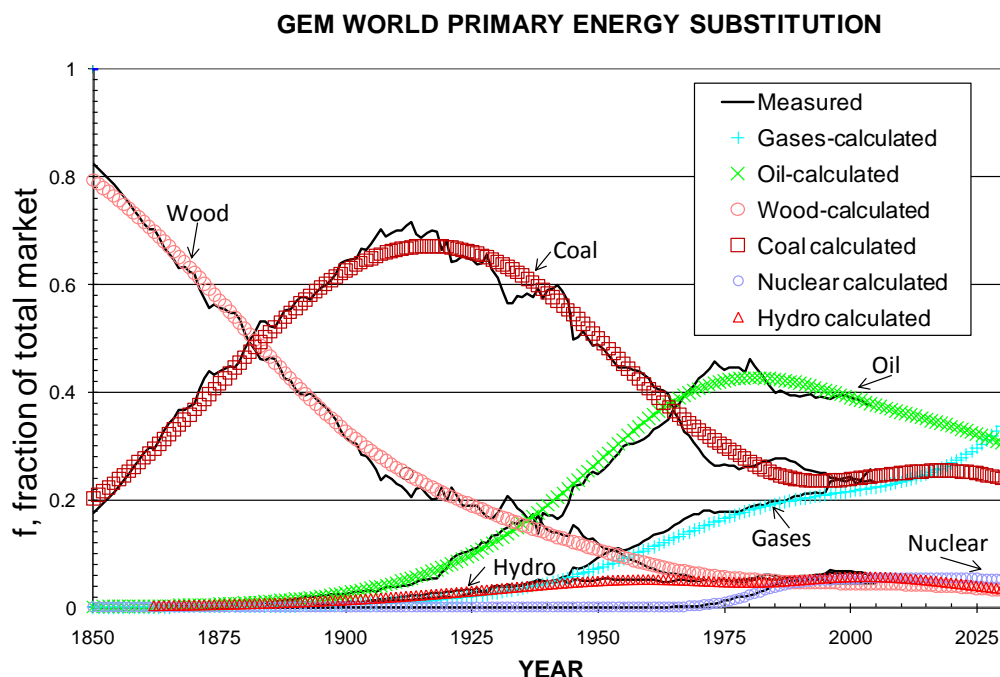

Fig. 1. World substitution curves from the GEM model including wood, coal, nuclear, hydro, oil and gases.

As seen in Figure 2, total carbon emissions have increased substantially since 1950 and will still be increasing in 2030 due to intensive use of fossil fuels. The individual curves show carbon production from wood (and other solids), coal, oil and natural gas, and the CO2 equivalent of the total emissions.
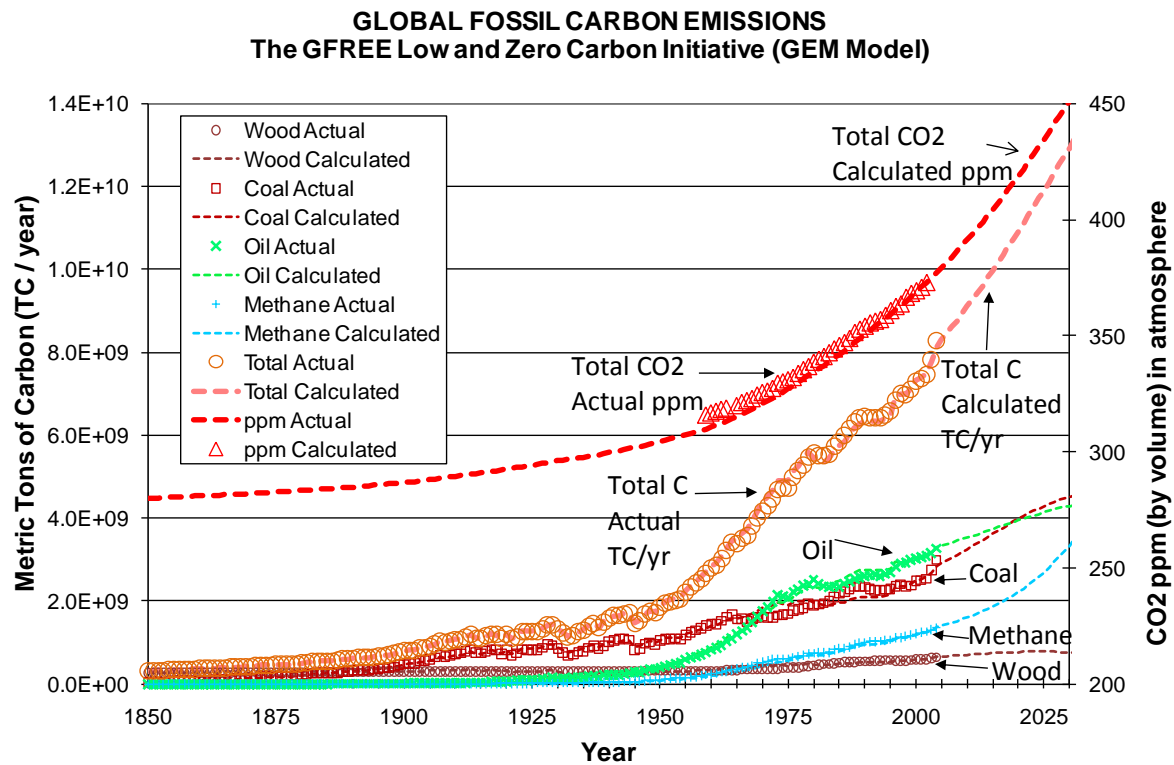
GLOBAL FOSSIL CARBON EMISSIONS
The GFREE Low and Zero Carbon Initiative (GEM Model)

Fig. 2. Actual and best fit global fossil carbon production and CO2 emissions.

Additional results from the GEM model will show that beyond 2030, carbon production and CO2 emissions will start to decline due to a switch to non-fossil and renewable energy sources. However, the transition will depend heavily on the choices made by governments, corporations and consumers.

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