S3-6 Low Carbon Future Energy and Emission Scenario up to 2050 for China

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Introduction

Climate change has been a global problem of unprecedented scale triggered by anthropogenic influences, and achieving low carbon development has been put on the agenda of all the countries, including developed and developing ones. For China which is expected to have a rapid economy growth in the future, realizing low-carbon development has become a significant social and economic development path in the future considering the international climate regime and domestic energy and environmental concerns. The issue of "how high is high and how low is low" could be explored for China using scenarios to explain the possible pathways of China's future to 2050 and imply the technology and policy implications, which is also the purpose of this report.

Methodology, scenario and data

Mid- and long-term energy demand and greenhouse gas (GHG) emission scenarios up to 2050 in China were developed using the IPAC (Integrated Policy Assessment Model of China) model. IPAC is an integrated model developed by ERI, to analyze China' s energy and environment policies. ERI has been doing long-term research in developing and utilizing energy model since 1992. After 1994, ERI had started to cooperate with some well-known research institutions in the world in the energy and climate change modeling field, and had successfully developed a group of models, which have their respective characteristics and policy analysis functions. Since 2000, ERI has started to develop the energy-environment integrated assessment model focusing on China, i.e. IPAC. In this study we use three models in IPAC, i.e. IPAC-CGE, IPAC-Emission global and IPAC-AIM/technology models.

Three scenarios including BAU (Business As Usual), LC (Low Carbon), and ELC (Enhanced Low Carbon) were developed under the different assumptions on economic (GDP) and energy development, and policy dynamics.

--BAU which means taking no climate change policies under the high GDP growth rate assumption.

--LC under the high GDP growth rate assumption considers factors of national energy security, domestic environment, and low carbon development strategy. This is the low carbon emission scenario which can be realized by domestic policies, which mainly takes into account the domestic social and economic development needs, as well as the environment development demand. Factors such as enhanced technology improvement, change in economic development mode, shift in consumption behavior, and realizing low-energy and low GHG emissions have been considered.

--ELC under the high growth rate assumption take into considerations that in the shared vision of global concurrent efforts to mitigation climate change, China can make further GHG emission reduction contributions. In this global efforts scenario, the technology is to be enhanced to a greater level; the cost for key technologies will have a sharper decrease; policies in the developed countries will expand to developing countries. Also in this scenario, it says that China can increase her investment in low carbon economy, and better use the low carbon opportunities to enhance the economic development after 2030 when China becomes the biggest economies in the world.

The main parameters and data for a series of scenarios were introduced, and policy options assessed in the model and the emission mitigation technologies are also presented in the paper and the presentation.

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Results and conclusion

All the scenarios show that the primary energy demand of China will increase steadily before 2050, and will be 4.7 to 6.6 billion ton standard coal by 2050. The primary energy demand under low carbon scenario in 2030 and 2050 will decrease by 22% and 24%, compared with that under basic scenario. Under the basic scenario, in 2050, the primary energy demand will be up to 6.657 billion standard coal from 2.189 billion standard coal in 2005, in which coal accounts for 44%, petroleum accounts for 27.6%, natural gas accounts for 10%, nuclear power accounts for 9%, hydro power accounts for 6%, and renewable energy such as wind and biomass power accounts for 3.4%.

Under LC, in 2050, the primary energy demand will be up to 5.082 billion tce from 2.189 billion tce in 2005, in which coal accounts for 37.4%, petroleum accounts for 20.2%, natural gas accounts for 14.4%, nuclear power accounts for 14.2%, hydropower accounts for 8.4%, and renewable energy such as wind and biomass power accounts for 5.4%.

The CO_2 emission will decrease obviously after 2030 in the ELC, compared to the LC, and will be 48% less than that of the LC in 2050. Based on the further strengthened energy- saving measures, the primary energy demand will decrease by 4.5%, renewable energy power and nuclear power will account for 57%, with an increase of 7%, compared to LC. At the same time, coal-fired power plant will be equipped by ICGG and CCS after 2020, and high energy-consumption industries such as steel and iron, cement, electrolytic aluminum, synthetic ammonia, refining and ethylene will largely adopt CCS. Buildings will adopt the renewable energy technologies widely, such as solar water heater and solar heating, while wind power for households and photovoltaic will be applied in appropriate buildings and areas.

The model's results and comparison show that energy demand and CO_2 emission in China will still increase quickly with the rapid development of economy in the future.. However, we do see ample opportunities for China to make the emission stable after 2020 without large increase, and even begin to decrease after 2030 from the modeling of alternative low carbon scenarios, of course, which is conditional on the current policies and actions. China must give emphasis on the development of advanced clean energy exploration, transformation, and utilization technologies, and renewable and nuclear power technology from now on. At the same time, improve the public awareness on the importance of low carbon life style, and implement the energy and carbon tax step by step.

Key words:
Emission scenarios; Energy; Climate change; Model