[*PAPER/POSTER TITLE*]
THE HEALTH AND ECONOMIC BENEFITS OF "COAL TO ELECTRICITY" POLICY IN RESIDENTIAL SECTOR

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Overview

The Beijing-Tianjin-Hebei (BTH) region is one of the most severely polluted areas in China and worldwide. In 2016, the annual average $PM_{2.5}$ concentrations in the BTH region ranged from 69~73ug/m³, much higher than the WHO guideline value. BTH is undertaking the most intensive air pollution control policies worldwide with tremendous efforts in controlling centralized fossil fuel use in the power generation, central heating and industry sectors. Substituting residential coal use, which contributes substantially to the $PM_{2.5}$ pollution in BTH, with electricity and gas has been announced by the government as one of the key strategies. This paper attempts to evaluate the health benefits of coal-to-electricity from both ambient and indoor air quality improvements with an integrated assessment model from 2015 to 2030.

Methods

This study used an integrated assessment framework consisting of GAINS (Greenhouse Gas - Air Pollution Interactions and Synergies) model, IMED/Health (Integrated Model of Energy, Environment and Economy for Sustainable Development/Health) model, and IMED/CGE (Computable General Equilibrium) model for both, ambient air pollution and indoor air pollution. This methodology aims to simulate the effects on energy structures, air quality, health end-points and monetize health impacts from the implementation of the "coal to electricity" policy.

Results

Results indicate that the control policy in 13th Five-Year Plan (FYP) will lead to a cost of 25.11 billion Yuan while health benefits of 39.66 and 17.81 billion Yuan in 2020 from ambient and indoor air quality improvement in the BTH region, respectively. Furthermore, the health and economic benefits will be more significant in 2030 with continuous implementation of the policy, especially if all three provinces/municipalities implement the "coal to electricity" policy simultaneously. Moreover, Hebei will face higher cost burden than Beijing and Tianjin owing to its larger household number, and the transition cost of coal substitution will be a challenge for the poorer households in Hebei, giving rise to policy implications to overcome the barriers and obstacles to improve the acceptability and feasibility with better designed fiscal transfer and subsidy policy. The methodology and findings from this study could be a good reference for similar assessment in other parts of China and the world.

Conclusions

The air quality in the BTH region is urgent to be improved and the control policy of replacing residential coal use by electricity was considered as an important strategy during the 13th FYP period. Based on scenario analysis and integrated modeling, this study evaluated the health related economic impacts of the control policy. Beijing obtained the greatest reduction of ambient PM2.5 concentration, and the regional integrate effects are significant to Beijing. In 2020, there is 17.4ug/m³ reduction of PM2.5 concentration in Beijing if all three BTH1 implement the control policy as planned in 13th FYP period, while the reduction of PM2.5 concentration in Tianjin and Hebei is not significant. This study assessed the health benefits from both ambient and indoor air quality improvement. With the implementation of the policy in the BTH region in 13th FYP period, there are 703.03 thousand of morbidity cases and 23.38 thousand of mortality cases avoided from ambient air quality improvement, meanwhile these value are 49.09 and 11.53 thousand persons for indoor. The benefits will accumulate and be more remarkable in 2030 with the sustained implementation of the policy after 13th FYP period. The GDP gains from the "coal to electricity" policy are insignificant, only 0.02%-0.15% in BTH. However, the control policy should be carried out since it will bring significant net benefits for the BTH region.