

Synergy Effect of Energy and Water Saving in China's Energy Sectors: A Multi-Objective Optimization Analysis

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Abstract : The '11th five-year' and '12th five-year' plans have clearly put forward to strictly control the total amount and intensity of energy and water consumption. The synergy effect of energy and water has rarely been considered in the process of energy and water saving in China, where its contribution cannot be maximized. Energy sectors consume large amounts of energy and water when producing massive energy, which makes them both energy and water intensive. Therefore, the synergy effect in these sectors is significant. This paper assesses and optimizes the synergy effect in three energy sectors under the background of promoting energy and water saving. Results show that: From the perspective of critical path, chemical industry, mining and processing of non-metal ores and smelting and pressing of metals are coupling points in the process of energy and water flowing to energy sectors, in which the implementation of energy and water saving policies can bring significant synergy effect. Multi-objective optimization shows that increasing efforts on input restructuring can effectively improve synergy effects; relatively large synergetic energy saving and little water saving are obtained after solely reducing the energy and water intensity of coupling sectors. By optimizing the input structure of sectors, especially the coupling sectors, the synergy effect of energy and water saving can be improved in energy sectors under the premise of keeping economy running stably.

Keywords : critical path, energy sector, multi-objective optimization, synergy effect, water

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