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Exploitation Contradictions Concerning Multi-Energy Resources among Coal, Gas, Oil, and Uranium: A Case Study in the Ordos Basin (Western North China Craton and Southern Side of Yinshan Mountains)

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Abstract: The particular “rich coal, meager oil, and deficient gas” energy structure of China determines its high degree of dependence on coal resources. After over 100 years of high-intensity mining activities in Northeast China, East Region, and the Southern Region, coal mining in these areas is facing a series of serious problems, which force China’s energy exploitation map to be rewritten. New energy bases will move to the western and northern regions in the next few years. However, overlapping phenomena of multiple resources are frequently encountered. Previous exploitation mainly focused on coal mining, which destroys many mutualistic and accompanying resources, such as uranium, gas, and oil. Aiming at solving this unscientific development mode, this research presents a case study in the Ordos Basin, where uranium, coal, and gas/oil show a three-dimensional overlapping phenomenon along the vertical downward direction. The upper uranium and lower coal situation in this basin is remarkable; specifically, coal mining disturbs the overlaying aquifer, thus requiring the uranium to be leached first. The technical approach must be sufficiently reliable to avoid the leakage of radioactive elements in subsequent coal mining procedures. Hence, the unbalanced injection and extraction of uranium mining is used to completely eradicate the discharged emissions to the environment. The gas and oil are typically not extracted because of their deep occurrence strata and their overlapping phenomenon with coal seams. Use of the integrated coal and gas production method is recommended, and relevant fracturing methods to increase the gas migrating degree in the strata are also introduced. The results and recommendations in this study are applicable in some other areas with similarities.

Keywords: coal; uranium; oil; gas; mining; exploitation contradictions; Ordos Basin

1. Introduction

Energy is an indispensable resource for mankind, and this dependency is becoming increasingly obvious in the 21st century. This increasing dependency is accompanied by a series of new emerging