

Balance of natural radionuclides in lignite-based power generation and consequences for the use of residues and by-products

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Abstract

Residues and by-products from the combustion of coal and lignite are re-used on various routes, such as fly ash from dust filters (used as aggregates in building materials), bottom ash/slag (used for road construction) or gypsum from flue gas desulphurisation. In the combustion process some natural radionuclides that are present in low concentration in the raw coal are partly concentrated and re-distributed in residues and by-products. The legal compliance and, perhaps even more importantly, the public acceptance of the re-use of residues and by-products from coal combustion critically depend on their radiological properties and our understanding of the underlying technological processes leading to enhanced specific activities of certain natural radionuclides. Using the example of the lignite mining and power generation industry in Saxony and Brandenburg, this paper reports on the systematic investigation of concentration and re-distribution effects and the development of a comprehensive radionuclide balance of all material stocks and flows from raw coal and auxiliary fuels to dry and wet ashes, gypsum, limestone and waste water. Our investigation has clearly shown that re-use of residues and by-products of lignite combustion in Saxony and Brandenburg is not radiologically relevant in most cases.