

TVA Research on Coal Combustion By-Products: Uses and Environmental Impacts

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ABSTRACT

Scientists within TVA's Air, Land & Water Sciences organization have performed research on coal combustion by-products (CCP) for a number of years through a variety of laboratory, greenhouse, and field projects. Research has focused on the benefits and environmental impacts of high-volume land application, practices to control environmental impacts of on-site storage, and on providing data that may affect current regulations or influence future legislation that governs off-site use or on-site storage of CCP. This paper highlights TVA's experimental and applied research on CCP including: 1) reactions of CCP in soil and water; 2) leaching of CCP constituents, particularly arsenic and metals; 3) greenhouse plant uptake and yield studies; 4) mine land reclamation with co-mixed CCP and municipal biosolids and the effects on chemical and physical properties of mine spoil, environmental parameters, and sustainable vegetation; 5) agricultural applications of co-mixed biosolids and CCP on crop yield and metal and nutrient uptake; 6) vegetation and turf production on CCP storage areas using minimal amounts of soil in conjunction with compost and fertilizer; 7) accelerated weathering of CCP to predict arsenic bioavailability; 8) ecological risk assessment, speciation, and fate of CCP-borne arsenic and metals; 9) impact of high-volume scrubber gypsum/fly ash application on groundwater quality; 10) reduction of ammonia loss and attenuation of phosphate and metals solubility by CCP during chicken litter composting; and 11) use of CCP to sequester CO₂ for algal biomass production and conversion to biofuels.