Biomass firing and CCS: Approaching Negative Greenhouse Gas Emissions at Shand Power Station

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Biomass available from agriculture within a 200 km radius of Shand was estimated by the Biomass Inventory Mapping and Analysis Tool (BIMAT). BIMAT, developed by Agriculture and Agri-Food Canada, allows users to view and analyze detailed information about biomass availability within Canada using digital maps and database searches. Converting Shand to BECCS with a 95% CO2 capture capacity gives a negative CO2 emission intensity which increases with increased levels of cofiring. With complete conversion of Shand to BECCS, its emission intensity is estimated at negative 1,384 tonnesCO2/GWh which equates to a 3% reduction in Saskatchewan's annual emissions. Affects to the cost of electricity were also considered. Factors influencing the cost of electricity are biomass purchasing and transportation costs. BECCS with BC pellets cases have significantly higher costs compared to other cases. For co-firing cases, higher levels of co-firing lead to slightly increased cost of electricity due to the requirement for transportation of biomass from greater distances. The cost of CO2 avoided from BECCS varies from 79.20 to 60.47 CAD$/tonne with co-firing and 71.44 to 90.06 CAD$/tonne with full conversion. The cost of CO2 avoided might be lower when the rate of co-firing straw is higher than 60%, however, it will require further study of additional biomass supplies such as forestry, energy crops, and marginal farming operations.