Characterization of Coal Utilization By-Products from Mercury Control Field Testing

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The US DOE is in the process of assessing capabilities of mercury control technologies for coal-fired utilities. Part of this assessment is to examine the fate of the mercury captured by the control technologies. Almost every control technology for mercury will impact the quality of the by-products generated by a coal-fired utility, with an anticipated increase in the concentration of mercury, cadmium, nickel, lead, arsenic, selenium and select halides found in the by-products. Over the next 2 years Frontier has been contracted by the US DOE to perform the necessary studies of the associated mobility pathways for the potential contaminants. These pathways include leachability, volatility and methylation. Leachability studies are being performed using a modified version of the US EPA Method 1312. The modification allows the assessment of any potential secondary mineral formation. The volatility studies have been designed in-house to represent the impact of elevated temperatures from, among other things, landfills, asphalt production, wallboard calcining and cement production. Using sulfate reducing bacteria the production of methyl-mercury, over a 30 day period, will be monitored to assess the methylation potential of by-products impacted by the control technologies.

The project is currently 50% completed and to date has spanned 135 separately collected samples from 15 separate locations, 8 presented within and performed greater than 8000 significant analytical steps to determine the presented results. It was observed that in general the Hg capture technology (Hg-CT) resulted in an increase of Hg in the ash and Se for one facility. The thermal releases from the ashes at 40°C over 30 days were statistically insignificant. Thermal releases at 190°C over 1 hour demonstrated themselves to be statistically significant for Hg in some facilities, but not all. Other facilities indicated a decrease in the thermal release upon use of the Hg-CT, leading to speculation that the Hg is somehow stabilized. In addition while the samples

collected at the fabric filter are independent to the use of Hg-CT, the samples collected at the SDA were dependant of the use of the Hg-CT. At 1200°C for 5 minutes, generally emission is independent of the Hg-CT with Se thermally emitting 100% for all but 3 facilities, which still have high Se emission rates. Mercury shows a significantly increased Hg thermal emission concentration. The SPLP leaching resulted in a very low amount of all target metals being leached. The microbial mobilization study resulted in the expected increase in Methyl-Hg production. However, the microbial activity also stabilized a number of target metals resulting in reduced mobilization.