Virginia City Hybrid Energy Center
Response to Data Request
Bruce Buckheit, Member, Virginia Air Pollution Control Board

Question (Page No. 6, Footnote No. 9):

Steam references the fact that coal washing improves boiler efficiency. Here, the project assumes that 2,000,000 tpy of ash (that otherwise would not be injected into the boiler) will be heated to 1500 degrees F. There will be an increase in emissions of CO2, hazardous and criteria pollutants associated with the extra combustion needed to accomplish this heating of the ash. This energy is wasted as this material then literally "warms" the globe as it is left to cool after being discharged from the boiler and overall boiler efficiency is decreased. I assume there is also an energy impact associated with coal washing. This impact should be estimated and compared as well.

Response:

Due to the use of biomass, CO_2 emissions will effectively be reduced relative to burning 100 percent coal.

The comment suggests that the larger volume of ash associated with unwashed fuel results in a less efficient facility. It contends that the energy required to heat the ash is wasted. That might be true for a pulverized coal boiler but not for a CFB boiler. In fact, a CFB boiler needs the ash to operate properly. Moreover, cyclones recirculate the ash within the boiler.

There are additional benefits of higher ash in CFB boilers. Higher ash fuel allows for a higher percentage of biomass. This is due to the fact that the corrosive alkali in the wood ash would be present in higher concentrations when combined with a low ash fuel. Due to the use of biomass, CO_2 emissions will be reduced relative to burning 100 percent coal. Furthermore, for unwashed ROM coal, chlorine is higher which is beneficial in mercury control. Therefore, higher ash unwashed coal is beneficial in the removal of Hg.

The bed ash in the boiler is at temperatures of 1500 to 1700 degF. To remove the ash efficiently, four fluidized bottom ash stripper coolers that cool the furnace bottom ash below 500 degF are utilized.

The heat rejected from the ash (85 mmbtu/KwH) is recovered by the condensate system. Condensate is fed from downstream of the gland steam condenser, which is the discharge side of the condensate pump, to the stripper cooler to cool the bed ash. The condensate passes through the stripper cooler and picks up approximately 85 mmbtu/hr of heat load which is returned to the steam cycle. This closed loop systems helps the steam cycle

efficiency by improving the heat rate by 53 btu/kwH and increasing the output by 2.1 MW.