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Investigation on co-firing of coal mine waste residues in pulverized coal combustion systems

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1 **Title:** Investigation on co-firing of coal mine waste residues in pulverized coal combustion  
2 systems

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## 9 10 **Abstract**

11 Millions of tonnes of coal mine waste residues are piled up in dumping sites, causing serious  
12 environmental problems. Co-combustion in fluidized bed facilities is the most widespread  
13 alternative for the energy utilization of these by-products. However, no experiences have been  
14 so far reported of coal mine waste residues co-firing under pulverized fuel combustion  
15 technology. This work proves the technical feasibility of co-firing coal with up to 20% coal  
16 mine waste residues and investigates the impacts of transferring this co-firing alternative into a  
17 commercial unit. Experimental co-firing tests of coal mine waste residues were conducted on a  
18 500 kWth pulverized fuel pilot plant. Regulated emissions (CO, CO<sub>2</sub>, SO<sub>2</sub> and NO<sub>x</sub>) and  
19 visible flame radiation were monitored, obtaining regular and stable flicker and acceptable  
20 emissions levels for CO (200 mg/m<sup>3</sup>N) and NO<sub>x</sub> (700 - 800 mg/m<sup>3</sup>N). Finally, the impact  
21 analysis of co-firing coal mine waste residues in a full-scale pulverized fuel plant was  
22 performed by simulating the power cycle and combustion process in a 160 MWe pulverized  
23 coal combustion unit. Simulation results show the viability of this alternative in terms of plant  
24 efficiency, increase in power consumptions of auxiliary equipment and pollutant emissions for  
25 co-firing ratios under 10 % in energy basis.

## 26 27 **Highlights**

- 28 ■ Experimental co-firing tests of CMWR and coal were conducted in a PCC pilot plant
- 29
- 30 ■ Lower combustion efficiency but stable conditions as CMWR share increases
- 31
- 32 ■ An impact analysis of co-firing CMWR in a full scale PCC plant was performed
- 33
- 34 ■ Plant efficiency reduction and emissions levels for CMWR co-firing are acceptable
- 35

36 **Keywords:** Coal mine waste residues, co-firing, pulverized coal combustion

## 37 38 **Abbreviations**

39 CCD – Charge coupled device

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