Available online at www.sciencedirect.com

SciVerse ScienceDirect

Energy Procedia 00 (2013) 000–000

Energy Procedia

www.elsevier.com/locate/procedia

GHGT-11

Oxyfuel combustion: technical and economic considerations for the development of carbon capture from pulverized coal power plants

Kyle J. Borgert[a,b], Edward S. Rubin[a,b]*

[a] *National Energy Technologyy Laboratory-Regional University Alliance (NETL-RUA),*
[b]*Carnegie Mellon University, Pittsburgh, PA 15217, USA*

Abstract

Oxyfuel has been hoped by many to provide the "step-change" in performance needed to drive down the avoidance cost of carbon capture from pulverized coal plants. To investigate this possibility, a techno-economic oxyfuel model was constructed. The model was exercised to explore the effect on CO2 avoidance cost and LCOE from several key parameters, namely: CO2 purity, oxidant purity, CPU and ASU performance and cost, coal composition, and geographic location. Monte-Carlo techniques were then used to generate distributions for CO2 avoidance cost and LCOE which were compared to costs for a representative amine based post-combustion capture system. Results indicate that increasing restrictions on CO2 exit purity will translate directly to higher avoidance costs. Consequently, any future pipeline purity standards should seek to balance costs with safety concerns and storage capacity limitations. A trade-off between equipment downsizing and energy of separation for oxidant purity was identified and found to be optimized in the 95-97% oxygen range. The effect of oxidant purity on CO2 transport cost is small (~2%) compared to the effects of CO2 exit purity (~15%). Both represent changes to a cost which amounts to only about 5% of the total avoidance cost. Stochastic modeling results provide evidence that oxyfuel technology is unlikely to be competitive with post-combustion capture for a number of coal types, especially those high in sulfur. Oxyfuel appears most promising for use with low-sulfur coals and is capable of delivering lower avoidance costs than amine-based capture when operated with co-capture of SO2 and non-condensable gases.

Selection and/or peer-review under responsibility of GHGT

Keywords: CO2 Capture and storage; Oxyfuel; Avoidance cost; LCOE

* Corresponding author. Tel.: 1-269-251-7663
E-mail address: kborbert@andrew.cmu.edu.