Energy Storage in an IGCC Coal Power Plant

BACKGROUND

There is a strong interest in replacing conventional coal power plant with Integrated Gasification Combined Cycles (IGCC), clean coal power plants based on coal gasification, for varieties of environmental and efficiency benefit. However, IGCCs respond to changes in load much more slowly than conventional coal power plant, and the response rate is reduced even more where CO2 sequestered by converting the gas to H2. There is an eager need to increase the ability to respond rapidly to fluctuations in demand, which is essential for controlling the stability of the grid.

INVENTION

This invention allows the gasifier of an IGCC (with or without a H2 plant) plant to operate full time by combusting the clean gas and storing heat in a bed of high temperature resistant material. The stored heat is recovered with very high efficiency and used to generate electricity through a steam power plant, which is capable of fast load following. This system is simple, efficient and cheap.

APPLICATIONS

- Enable rapid load-following in an IGCC power plant.
- Supply instantaneously dispatchable electricity, when grid faces large changes in demand during short period.
- Increase the capacity of an existing IGCC power plant by approximately 75%.

ADVANTAGES

- High thermal efficiency of over 90%.
- Fast response and increase turndown ratio to 2:1.
- The heat storage separates gas production from the size of the power plant. The plant can be sized for total KWH required for load following, but not maximum capacity.
- Much cheaper initial investment than the cost of storing H2 or syngas or any other method for storing electricity.
- Easy field construction. Factory-designed modular equipment can be shipped by truck and assembled on location.

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