An Investigation of Carbon Sequestration/ECBM Potential in Australian Coals: A Simulation Study for Sydney Coal Basin

by

Rahul Shrivastava

A Thesis Submitted to

the Australian School of Petroleum

of

the University of Adelaide

in partial fulfilment of the requirements for the degree of

Master of Engineering Science

in

Petroleum Engineering

16th February 2006
Adelaide, Australia

ABSTRACT

A 2002 report by Australian National Greenhouse Gas Inventory suggests that since 1990 Australia's net emissions of carbon dioxide equivalent from stationary combustion sources are on the rise and they are likely to rise even at a higher rate in keeping with continued economic and industrial growth. In order to reduce Australian CO_2 emissions, there is a need to identify and explore large-capacity storage locations for CO_2 sequestration. In that context, Australian coal seams, notably the coal-bed methane (CBM) reservoirs in Sydney and Bowen Basins, could potentially be attractive sites to sequester large volumes of greenhouse CO_2 emissions while also recovering the methane gas, a relatively cleaner source of fossil fuel.

This study investigates the deliverability and economic feasibility of CO_2 sequestration through CO_2-Enhanced CBM recovery (CO_2-ECBMR) in the Camden area, Sydney coal basin. The results of the study show that the CO_2-ECBMR impacts the absolute permeability of the Camden area significantly. Because of a good reticulated fracture system, the CO_2 breakthrough from the producers is faster. The enhancement of CH_4 recovery by preferential adsorption of CO_2 occurs simultaneously with the abatement of CH_4 recovery by overall decrease in permeability in the CBM reservoir. Hence, the actual CH_4 is produced under the overall effect of these two competing processes, with the operating parameters like producer-injector spacing and injection pressure affecting their relative dominance over each other. The study also addresses the opportunities of a niche for CO_2 sequestration in these coals, which will be dictated mainly by the factors of sequestration economics and status of these coals being "unmineable". The results derived from the study could help the design of an optimum operating strategy in implementing the CO_2 sequestration and enhanced CBM recovery in Sydney Basin, Australia and elsewhere.

TABLE OF CONTENTS