AAPG Annual Meeting
March 10-13, 2002
Houston, Texas

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Co-generation, Ethanol Production and CO2 Enhanced Oil Recovery: a Model for Environmentally and Economically Sound Linked Energy Systems

An electrical co-generation, ethanol fuel production and carbon dioxide (CO2) enhanced oil recovery (EOR) project in central Kansas is a unique scalable model for linked energy systems. Waste heat from a 15-megawatt gas-fired turbine municipal generator provides heat inputs for a 25 million gallon per year ethanol plant. Carbon dioxide, a fermentation process byproduct of ethanol production, will be utilized by a CO2 miscible flood demonstration project. Efficiencies gained in byproduct utilization and energy use by linking traditional and alternative energy systems enhance the economics of each while creating environmental benefits through geologic sequestration of CO2.

The Kansas project is the first to use CO2 emissions from ethanol production in an EOR project. The full CO2 stream from this single ethanol plant could supply a small commercial project capable of producing five million barrels of oil and sequestering 1.5 million tons of CO2 over twenty years. Currently the U.S. ethanol industry is directly, or indirectly, releasing five million tons of CO2 per year to the atmosphere. However, ethanol production (and associated CO2 emissions) is projected to double by the year 2005 as ethanol replaces MTBE as a gasoline oxygenate. Through linked systems of power generation, ethanol production and CO2 enhanced oil recovery, opportunities exist for "value added" geologic CO2 sequestration. Strategically locating and scaling "Kansas models" near CO2 EOR target reservoirs that are distant from traditional geologic CO2 sources could add significant EOR reserves throughout the U.S., strengthen the ethanol industry and cost-effectively sequester CO2.