1108-91-242   **Xuwei Yang*** (`yangx@pstat.ucsb.edu`), Dept. of Statistics & Applied probability, University of California, Santa Barbara, CA 93106-3110. *Mean Field Game Approach to Production and Exploration of Exhaustible Commodities.*

We study energy market with a continuum of players who produce energy with exhaustible resources. Each one chooses quantity of production to optimize profit that is a function of market price and quantity of production. The players interact with each other through the market price that depends on the production of all the players. We employ mean field game approach to solve for Nash equilibrium of the game. The game with a continuum of players is characterized by a system of partial differential equations: a backward Hamilton-Jacobi-Bellman (HJB) equation for the value function of a representative player and a forward transport equation for the distribution of the players. Through the system we compute players' Nash equilibrium strategies, and the resulted total energy production, market price, and reserves distribution. The novelty is that we study the exploration effect in the mean field game framework. The exploration is modeled through a controlled Poisson process that leads to stochastic increment to the reserves level. The jumps resulted from the Poisson process leads to a partial integral-differential equation for the transport equation, and a forward-delay term in the HJB equation, which involve more analytic and numerical complexity. (Received January 15, 2015)

1