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Lifecycle Analysis and Green House Gas Regulation of Fuels

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For several of the emerging fuel sources, such as biofuels, oil sands, and coal-to-liquids, GHG emissions arise not only during final use but also during multiple stages of their production. Since GHG emissions are a global pollutant, regulation of these energy sources for GHG emissions should target limiting the total GHG emissions arising during the lifecycle of the product and not merely that from combustion. However, pollution control policies have thus far been designed only to limit emissions arising directly at a polluting site (such as an industrial facility or an automobile). They have not been designed to regulate firms for emissions produced off-site either by the same firm or by other firms. Given this context, my dissertation focuses on the following two topics. (1) Estimation of lifecycle emissions: Regulation based on lifecycle emissions requires that we are able to estimate emissions reasonably well, especially when there is heterogeneity and uncertainty. I will discuss the strength and weakness of material balance based estimation of lifecycle emissions from a policy perspective. A method to estimate lifecycle emissions as a function of prices will be described. (2) GHG regulation of fuels: Policy makers can choose from several different instruments such as emission fees, standards and tradable emission quotas for controlling emissions. Traditionally, flow-pollutants that can pose health risk have been regulated using standards, while tradable quotas have been used for regulation of stock pollutants including GHG. However, GHG regulation of transportation fuels such as California's Low carbon fuel standard and the EPA's proposed carbon intensity limits on alternative fuels represent a departure from such a past. I will describe the pros and cons of GHG standards for fuels.

Deepak Rajagopal is a PhD candidate in the Energy and Resources Group and MS candidate in Agricultural and Resource Economics at University of California Berkeley. His research interests include energy and environmental policy, life cycle analysis of energy systems, agricultural policy, and distributed power generation. His research has been published in Environmental Research Letters, Water Policy, Foundations and Trends in Microeconomics with others forthcoming in Annual reviews of Resource Economics, Handbook of Bioenergy Economics, California Agriculture, and AgBioForum. He also holds a Masters degree in mechanical engineering from University of Maryland, College Park and Bachelor's degree in mechanical engineering from Indian Institute of Technology, Madras. Before beginning his PhD he worked for three years as a structural engineer at United Technologies Research Center in Hartford, Connecticut on the design and optimization of technologies such as gas turbines and fuel cells.