Editorial

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What could be possible with mature biofuels technologies?

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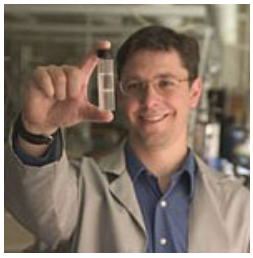

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This special issue of *Biofuels, Bioproducts, and Biorefining* features a series of papers that result from a project called 'The Role of Biomass in America's Energy Future' (RBAEF). The most comprehensive study of its kind, the RBAEF project began in early 2003 with the goal of better understanding the role biomass could ultimately play in meeting the energy needs of the United States. Accordingly, the focus was in defining the likely performance of mature technologies and how these could be configured to make a large contribution to meeting energy needs while preserving environmental quality and accommodating competing land uses.

Biofuels scenarios offer significantly reduced greenhouse gas emissions

The RBAEF project is of tremendous importance in light of the limited options we have for sustainably meeting our ever-growing energy needs and particularly of powering a transportation sector that depends almost totally on a strategically vulnerable energy source with such high price volatility: petroleum. Only three options are known for providing sustainable energy for transportation on a meaningful scale: i) batteries if charged by electricity from renewable energy sources, ii) hydrogen when generated from renewable sources, and iii) biomass. Of these, biomass is the only resource that can be converted into liquid transportation fuels that have desirable characteristics for mobility and are likely required for such applications as aviation and long-haul trucking.

The current controversy surrounding first-generation biofuels for making ethanol from corn has clouded the biomass picture and can lead decision-makers,

investors, and talented researchers to abandon pursuing technologies associated with making fuels from biomass. Unfortunately, the outcome can become a classic case of throwing the baby out with the bath water as the elimination of the only option we have for sustainably making liquid fuels leads to indecision that increases our vulnerability to the political, environmental, strategic, and economic consequences of depending on petroleum. The history of examining sustainable technologies shows that, all too often, projected costs and impacts are inversely proportional to ignorance, and we can continually chase what seem like better options only to be disappointed. After all these years of searching, only the options noted above are known for fueling transportation, and the time to act is now, before economic, environmental, and social consequences grow even more severe. We cannot afford to thrust such a momentous problem on future generations to solve while dealing with much greater populations, fewer resources, and grave environmental degradation.

In this context, the contributions in this issue are significant in that rather than getting bogged down in citing the limitations of current technologies and their inherent challenges for converting biomass to fuels, power, and chemicals, the authors project what we can likely achieve given a sustained effort as well the substantial benefits that would result therefrom. Such a 'high-beams' perspective should be invaluable to researchers and policy-makers in understanding transportation options, impacts, and benefits, and in making informed choices.

The issue begins with a paper which outlines the RBAEF approach by Lynd, Larson, Greene, Laser, Sheehan, Dale, McLaughlin, and Wang, principals in the study.[1] Next, Sokhansanj, Mani, Turhollow, Kumar, Bransby, Lynd, and Laser provide insights into current technologies and the potential for evolution in the production, harvest, and transport of switchgrass for use as a biomass feedstock to support the production of energy. This is followed by two papers by Celi, Jin, and Larson describing future performance of advanced gasification systems for generating either electric power or for coproducing fuels and electricity from switchgrass. Next, Laser, Jin, Jayawardhana, and Lynd focus on ethanol production from switchgrass with coproduction of electrical power, again using switchgrass as a feedstock. The sixth paper in this issue, by Dale, Allen, Laser, and Lynd, outlines how coproduction of animal feed with fuels and chemicals could alleviate competition for land between food and fuel. These studies set the stage for consideration of how mature technologies could evolve for coproduction of fuels, power, and animal feed protein *via* combinations of biological and thermochemical routes in a paper by Laser, Jin, Jayawardhana, Dale, and Lynd. The series concludes with an analysis of the projected efficiencies, environmental impacts, and economics for 14 scenarios of projected mature biological and thermochemical technologies for the processing of cellulosic biomass into fuels, chemicals, power, and animal feed by authors Laser, Larson, Dale, Wang, Greene, and Lynd. A key take-home message is that compared to petroleum-derived fuels, most of the biofuels scenarios offer comparable, if not lower, costs and significantly reduced greenhouse gas emissions, while several can realize similar efficiencies.

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