Session 1

Feedstock Production, Genetic Modification, and Processing

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This session covered a very wide range of topics from an overview of the reorganization of the DOE Biomass Program to chemical pretreatment alternatives and discussion of a kinetics model for pretreatment. The majority of the oral presentations addressed ways of improving or identifying feedstock quality. Reports related to improving feedstock quality included (1) identifying the effects of corn variety on starch to ethanol conversion, (2) identifying the genes that control cellulose characteristics in aspen trees, (3) use of physical separation methods to improve wheat straw quality, and (4) use of fungal pretreatment during storage and handling to improve digestibility of lignocellulosic feedstocks. The report of a feedstock composition analysis technique, Near InfraRed (NIR), offered the promise of being able to select feedstocks based on quality either at the plant gate or, better yet, in the field where it can enhance genetic improvement programs.

Valerie Sarisky-Reed of DOE noted in her overview that the market potential for ethanol from corn stover is as high as 10 billion gallons if cost of production can be reduced. Reduction of cellulase enzyme costs was identified as the number 1 priority for advancing sugars platform technology. Dr. Bothast of USDA reported that some varieties of corn grain convert more efficiently to ethanol than others due to differences in percentage and availability of starch. He also reports that utilization of corn fiber could increase the amount of ethanol per bushel of corn by 10%. Bonnie Hames of the National Renewable Energy Laboratory presented information on a Near InfraRed (NIR) spectroscopy for rapid biomass analysis to identify composition of biomass resources. NIR could both facilitate purchase of feedstocks with preferred qualities and help breeders develop plants with preferred qualities. Work now is focusing on calibrating the NIR techniques against standard wet-chemistry techniques, a process that must be repeated for each type of feedstock to be

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analyzed. Chandrashekhar Joshi of Michigan Technological University is working to identify the suite of genes responsible for producing the different types of cellulose found in aspen trees with the ultimate goal of creating genetically modified trees with desirable feedstock quality. Work reported by Richard Hess of Idaho National Engineering and Environmental Laboratory is focusing on improving feedstock quality of wheat straw by physical separation of feedstock components and by genetic selection. Quang Nguyen and others from the National Renewable Energy Laboratory work on modifying feedstock quality during the storage and handling phase by using fungal pretreatment. Studies on the effectiveness of different fungi are being conducted. The final two presentations addressed more traditional methods of pretreatment, with Todd Lloyd and Charlie Wyman from Dartmouth developing a kinetics model based on a depolymerization mechanism to describe how hemicellulose may be degraded and solubilized. Peter van Walsum and collaborators of the University of Texas described experimental and model results suggesting that pretreatment with carbonic acid eliminates some of the problems associated with sulfuric acid with comparable energy and capital costs.