Cellulosic Biofuel Technologies

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EXECUTIVE SUMMARY

The United States imports 60% of its petroleum. This contributes substantially to the country's negative balance of payments. Half of the imported petroleum (30% of total consumption) comes from unstable parts of the world. Domestically produced biofuels could replace the petroleum imported from these unreliable sources, thus reducing dependence on foreign oil and increasing national energy security.

Biofuels currently produced in the United States are primarily ethanol from corn and biodiesel from soybeans. Increased demand for these grains by the burgeoning grain-based biofuel industry is driving grain prices up and creating considerable concern about the potential negative impacts on a wide range of food products that depend on grain: chicken, pork, beef, and dairy products such as milk, cheese, yoghurt, cream and ice-cream. Consequently, development and commercialization of technologies to produce biofuels from cellulosic materials such as wood, grasses, crop residues and animal waste deserves urgent attention, and the objective of this study was to identify and evaluate technologies for production of cellulosic biofuels.

Information for this report was obtained from literature and web searches, attending conferences, visiting government agencies and private companies, and conducting informal interviews. In some cases it was necessary to sign non-disclosure agreements, which precluded publishing information from the associated entities. However, considerable valuable insights were obtained from these confidential sources.

The key findings of this study were:

1) Considerable activity in developing and commercializing cellulosic biofuel technologies is occurring under cover in the private sector, and this includes some of the most promising processes.

2) Besides technologies to produce cellulosic ethanol, procedures are also being developed to produce cellulosic diesel (not biodiesel, from vegetable oil), cellulosic gasoline, and cellulosic aviation fuel.

3) For production of cellulosic ethanol, gasification and catalytic conversion (the thermochemical route) appears to offer greater promise than acid or enzyme hydrolysis followed by fermentation (the biochemical route).

4) Production of cellulosic diesel, gasoline and aviation fuel by depolymerization and catalytic synthesis has received relatively little attention, but appears to be superior to all other technologies and may be demonstrated commercially within a year.