Certain biofuel mandates unlikely to be met by 2022; unless new technologies, policies developed

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It is unlikely the United States will meet some specific biofuel mandates under the current Renewable Fuel Standard by 2022 unless innovative technologies are developed or policies change, says a new congressionally requested report from the National Research Council, which adds that the standard may be an ineffective policy for reducing global greenhouse gas emissions. Achieving this standard would likely increase federal budget outlays as well as have mixed economic and environmental effects.

In 2005, Congress enacted the Renewable Fuel Standard as part of the Energy Policy Act and amended it in the 2007 Energy Independence and Security Act. The amended standard mandated that by 2022 the consumption volume of the renewable fuels should consist of:

- 15 billion gallons of conventional biofuels, mainly corn-grain ethanol;
- 1 billion gallons of biomass-based diesel fuel;
- 4 billion gallons of advanced renewable biofuels, other than ethanol derived from cornstarch, that achieve a life-cycle greenhouse gas threshold of at least 50 percent; and
- 16 billion gallons of cellulosic biofuels produced from wood, grasses, or non-edible plant parts -- such as from corn stalks and wheat straw. Except for biodiesel, these volumes are measured in

ethanol units.

The committee that wrote the report said that production of adequate volumes of biofuels are expected to meet consumption mandates for conventional biofuels and biomass-based diesel fuel. However, whether and how the mandate for cellulosic biofuels will be met is uncertain. Currently, no commercially viable biorefineries exist for converting cellulosic biomass to fuel. The capacity to meet the renewable fuel mandate for cellulosic biofuels will not be available unless the production process is unexpectedly improved and technologies are scaled up and undergo several commercial-scale demonstrations in the next few years. Additionally, policy uncertainties and high costs of production may deter investors from aggressive deployment, even though the government guarantees a market for cellulosic biofuels up to the level of the consumption mandate, regardless of price.

Greenhouse Gas Emissions

The extent to which using biofuels rather than petroleum will reduce greenhouse gas emissions is uncertain, the report says. How biofuels are produced and the changes in land use or land cover that occur in the process affect biofuels' impact on such emissions. Dedicated energy crops will have to be grown to meet the mandate, which will probably require conversion of uncultivated land or the displacement of commodity crops and pastures. If the expanded production involves removing perennial vegetation on a piece of land and replacing it with an annual commodity crop, then the land-use change would incur a one-time greenhouse gas emission from biomass and soil that could be large enough to offset benefits gained by displacing petroleum-based fuels with biofuels over subsequent years. Such land conversion may disrupt any future potential for storing carbon in biomass and soil. In addition, the renewable fuel standard can neither prevent market-mediated effects nor control land-use or land-cover changes in other countries.

Economic Effects

Only in an economic environment characterized by high oil prices, technological breakthroughs, and a high implicit or actual carbon price would biofuels be cost-competitive with petroleum-based fuels, the committee concluded. The best cost estimates of cellulosic biofuel are not economical compared with fossil fuels when crude oil's price is $111 per barrel. Furthermore, absent major increases in agricultural yields and improved efficiency in converting biomass to fuels, additional cropland will be required for growing cellulosic feedstock. This could create competition among different land uses and, in turn, raise cropland prices.

In addition, achieving the renewable fuel standard would increase the federal budget outlays, mostly as a result of increased spending on grants, loans, loan guarantees, and other payments to support the development of cellulosic biofuels and foregone revenue as a result of biofuel tax credits. Moreover, nutritional and other income assistance programs are often adjusted for changes in the general price level. If food retail prices go up, expenses could increase for the Supplemental Nutrition Assistance Program and Special Supplemental Assistance Program for Women, Infants, and Children, as well as for much larger income assistance programs, such as Social Security, military and civilian retirement programs, and Supplemental Security Income Program. Nevertheless, given that biofuels are only one of many factors affecting food retail prices, it will be hard to attribute any future increases in program costs to the standard alone.

Environmental Effects

Although biofuels hold potential for providing net environmental benefits compared with using petroleum-based fuels, specific

environmental outcomes from increasing biofuels production to meet the renewable fuel consumption mandate cannot be guaranteed. The type of feedstocks produced, management practices used, land-use changes that feedstock production might incur, and such site-specific details as prior land use and regional water availability will determine the mandate's environmental effects, the report says. Biofuels production has been shown to have both positive and negative effects on water quality, soil, and biodiversity. However, air-quality modeling suggests that production and use of ethanol to displace gasoline is likely to increase air pollutants such as particulate matter, ozone, and sulfur oxides. In addition, published estimates of water use over the life cycle of corn-grain ethanol are higher than petroleum-based fuels.

Barriers and Opportunities

Key barriers to achieving the renewable fuel mandate are the high cost of producing cellulosic biofuels compared with petroleum-based fuels and uncertainties in future biofuel markets, the report finds. Biofuel production is contingent on subsidies, the nature of the mandate, and similar policies. Although the mandate guarantees a market for the cellulosic biofuels produced, even at costs considerably higher than fossil fuels, uncertainties in enforcement and implementation of the mandated levels affect investors' confidence and discourage investment. To reduce costs of biofuels, the committee suggested carrying out research and development to improve feedstock yield and increasing the conversion yield from biomass to fuels.

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