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ETHANOL FROM LIGNOCELLULOSIC BIOMASS

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Commercially deployed biofuels already provide a significant contribution for the transport sector currently, but will not be sufficient to reach the targets for the future. Significant R&D and pilot activities have been going on for the past decade worldwide to enlarge the feedstocks basis by additional sustainable and competitive resources, and to develop processing technologies able to deal with a wider feedstock basis. The efforts have been focused on enhancing feedstock conversion in valuable energy and co-products, minimizing overall energy consumption and meeting better sustainability performance. As a result of the R&D efforts, a wide variety of advanced biofuels conversion technologies already exist, but they are not commercially available yet.

Among second generation biofuels, cellulosic ethanol is one of the most promising technological options available for the near future. Cellulosic ethanol has the potential to perform better in terms of energy balance, GHG emissions and land use requirements than starch-based biofuels. Cellulosic ethanol can be produced from agricultural and forest residues, wood wastes, the organic part of municipal solid wastes (MSW) and energy crops such as energy grasses and short rotation forestry. These lignocellulosic raw materials are more abundant and generally considered to be more sustainable, since they have low or no additional land requirements or impacts on food and fibre production. However, the processing of cellulosic feedstocks into ethanol is more complex than processing sugar- and starch-based crops and it will not become fully

commercial nor enter the market without a significant improvement in the technology.

The biochemical processes to produce cellulosic ethanol involve the pretreatment of lignocellulosic biomass to increase the accessibility of hydrolytic enzymes and the conversion of cellulose and hemicellulose into bioethanol through a saccharification followed by a fermentation step.

Biofuels Unit at CIEMAT has a large experience on developing processes and technologies for producing ethanol from lignocellulosic biomass. In this presentation a summary of R&D activities in the field of pretreatment, enzymatic hydrolysis and fermentation developed recently by CIEMAT will be presented.