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The Expanding Role of Biofuels for America

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Senator Harkin, Senator Thune, thank you for the opportunity to provide testimony on the expanding role of biofuels in America. I am Steve Corcoran, the President and CEO of KL Energy Corporation, a biofuels engineering company located in Rapid City, South Dakota. I am accompanied today by Dave Litzen our Chief Technical Officer and Vice President of Engineering. Over the last several years, KL Energy has transformed from a first generation biofuels company to an organization which today is focused on providing second generation technology for the conversion of Lignocellulosic feedstock to ethanol. Production of first generation biofuels, particularly corn ethanol will continue to improve and therefore will play a continuing role in future biofuel demand. Our experience from deploying and using first generation biofuels is being transferred to support and guide our second generation biofuels development.

Technology combined with a sound business model will be central to boosting the role of advanced biofuels. While there are several technological pathways to second generation biofuels, KL Energy has focused its research to develop a unique thermal-mechanical pretreatment process to make ethanol from biomass feedstocks in a fermentation process. The use of biomass feedstocks for transportation fuels, bio-products and power is increasingly being viewed as an opportunity to enhance energy security, provide environmental benefits and increase economic development, particularly in rural areas. Beyond the currently accepted benefits of biomass-derived ethanol, our nation's car manufactures and fuel suppliers have a unique opportunity to leverage the elevated octane that

ethanol/gasoline blends provide. The current energy policy identifies specific targets for increasing automotive fuel economy by 2020 that present a great challenge to our car manufacturers. KL Energy would also encourage the industry to take advantage of the increased octane of higher ethanol blends. The octane rating of an automotive fuel is frequently misunderstood or misapplied by the general public, but in general the higher fuel octane rating enables higher engine compression, resulting in improved mileage efficiency without loss of power or performance. While the nation's public appears to be quite vocal about the loss in mileage when using alcohol-blended fuels in the current engine designs, the public is strangely silent on utilizing this positive characteristic of an alcohol-blended fuel. We need only to look as far as our engine and fuel design laboratory, the racing industry, to prove this point.

Since 2001, KL Energy Corporation made significant investments in Research and Development predominantly from private sources and self-funded efforts. Beginning at the laboratory and pilot scale, our R&D efforts focused on pretreatment. The purpose of pretreatment is to alter the structure of the biomass so that cellulose, which is entrapped in the lignin and hemicellulose matrix, can become more amenable to the enzymatic process. Some of the desired characteristics of our pretreatment are: enabling high conversion of all biomass carbohydrates to ethanol, enriching the lignin while preserving lignin chemistry, minimizing sugar degradation during pretreatment, and achieving high slurry consistencies, all in an environmentally friendly and cost effective manner. Our pretreatment is effective on softwoods, hardwoods, and other herbaceous

forms of biomass because the process retains these characteristics. The research at the laboratory and pilot level resulted in construction of our commercial demonstration facility in 2007 capable of commercial operations using wood waste from the Black Hills National Forest to produce ethanol. The facility, Western Biomass Energy, is located in Upton, Wyoming and includes pretreatment, hydrolysis, fermentation, distillation, and co-product recovery stages, allowing us to evaluate our process for making ethanol at scale and validate cost and performance assumptions to prepare for the deployment of commercial plants.

Our business model for the commercialization of our technology is referred to as Community Energy Centers which will produce advanced biofuel (cellulosic ethanol), and bio-coproducts: lignin wood pellets, and syrup (value as animal feed or boiler to supplement heating demand). Our model focuses on economic development for our rural economy and is guided by three basic principles:

First -- to understand the locally available biomass feedstock. The economic competitiveness of cellulosic ethanol production is highly dependent on feedstock cost. Consequently, as the deployment of Energy Centers approaches, feedstock cost and availability are the driving factors that influence locations. KL Energy believes that providing flexible plant designs on the basis of feedstock availability rather than ethanol production will result in low cost, niche feedstock opportunities, minimizing the ethanol production cost. The recent provisions of the Biomass Crop Assistance Program (BCAP) which provides matching payments for the collection, harvest, storage, and transportation

(CHST) will encourage sustainable feedstock availability for the production of ethanol production.

Second -- to work with local economic developers. We want to keep the footprint of the operation small and close proximity to our feedstock source. The availability of sustainable, cost effective feedstock is essential for an economically viable cellulosic advanced biofuel facility. Our modular, decentralized design also offers better access to synergistic opportunities, such as co-locating with wood pellet production plants, existing cogeneration facilities, or sawmills. Because rail access is generally not necessary, the small energy center concept will create local jobs and energy sustenance in many communities that might not normally have the opportunity. A movement for decentralizing electrical power generation is afoot, and is a concept that can benefit liquid and solid fuel generation, too.

Third -- to optimize and leverage the value of the lignin co-product. Our technology has the ability to take lignin -- the outer layer that binds and protects the biomass fiber -- and create pellets that can be burned in place of coal in power plants. Lignin pellets yield up to 20% higher energy content over conventional wood pellets since most of the lower energy cellulosic sugars were removed for conversion to ethanol. As a natural consequence of the KL Energy ethanol process, the lignin co-product can be compressed into a highly durable pellet having a bulk density that is 20% higher than a typical wood pellet, reducing transportation yield loss and transportation costs. KL Energy is also developing value-added uses other than fuel for the lignin co-product.

Consistent with recent EPA studies, KL Energy's process will achieve at least an 85% reduction in GHG emission as compared with gasoline. By applying the fermentation process to convert biomass, the potential exists to actually REMOVE atmospheric carbon dioxide, the only industrial process we know of that can make this claim. In utilizing waste generated continuously by the forest products industry and the forest itself, we see the impact of strategically placed small energy centers as a win for locally produced and locally consumed energy -- and a win for forest management by providing a destination for slash piles that are currently burned or simply left to rot. The positive impact of turning forest waste into usable fuels and other products benefit the environment by reducing or eliminating the prescribed burning of the waste, eliminating the generation of particulate matter during the burn and the cost of soil remediation after the burn. The current energy policy restricts the use of waste from public lands, a restriction that must be reversed to help facilitate the implementation of all the positive benefits of biomass utilization presented by myself and my colleagues joined here today.

If government continues to aggressively pursue second generation biofuels research and development; enact investor-friendly tax incentives for production and blending; enable the use of waste material from public lands, and help to promote research & development in new biofuels feedstocks such as cellulosic ethanol, the prospects for achieving sustainable biofuels markets will become a reality. Cellulosic ethanol represents a new way to pursue the goals of increased

energy security and economic development for our rural economy, while protecting the quality of our environment. Thank You.