

**Testimony before the Tennessee Senate
Committee on Commerce, Labor and Agriculture**

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Good afternoon, Chairman Southerland and members of the Committee, and thank you for this opportunity to speak to you today about the opportunities to propel Tennessee forward in leading the development of a new bioenergy industry in Tennessee.

My name is Kelly Tiller, and I am an agricultural economist at the University of Tennessee. I have had the opportunity to work with leadership from the University of Tennessee to respond to a request from Governor Bredesen about a year ago that that we develop a careful strategy for Tennessee to lead the Southeast and the Nation in developing a vibrant renewable bioenergy industry in the state.

The result is the proposed Tennessee Biofuels Initiative. At its core, it is an approach to realize the vision of a flourishing bioeconomy in Tennessee, producing a billion gallons of cellulosic ethanol throughout the state using local farm and forest sources, for about \$1 per gallon.

The centerpiece of the Biofuels Initiative is the construction and operation of a 5 million gallon per year research-focused cellulosic ethanol facility in East Tennessee, fed primarily with locally grown switchgrass. In developing the Biofuels Initiative, we recognized early on that our wisest investment in our future—with huge potential payoffs—is in converting locally grown switchgrass and other cellulosic materials to ethanol.

In the U.S., producing ethanol from corn grain and producing biodiesel from soybean oil and greases have dominated renewable fuels efforts and investments so far. The Renewable Fuels Association reports that there are currently 76 ethanol plants under construction in the U.S., in addition to the 113 already operating, all turning corn into energy.

Corn to ethanol and soybeans to biodiesel are important stepping stones in reducing our dependence on petroleum-based transportation fuels. But most everyone recognizes by now that these are not long-term solutions to our growing transportation fuel problems, and that there are definite limits on the capacity to scale up traditional ethanol production to meet rising fuel demands. Recent corn prices of \$4 per bushel or more and soybean prices of \$7 per bushel underscore the delicate balance among fuel, food, feed, and export markets and land uses.

Corn-based ethanol and soy-based biodiesel will continue to play a role in meeting our renewable fuel demands for the foreseeable future. But after careful study, we—along with most other scientists and analysts—have concluded that cellulosic ethanol is really our only option to feasibly displace a significant portion of our petroleum-based transportation fuels, at least in our

lifetimes. The expectation that cellulosic ethanol is the key to a future where we generate our own renewable fuels cleanly and sustainably and independently is *good news* for Tennessee.

One crop that appears to hold significant potential as a dedicated energy crop is switchgrass. Switchgrass is a high-yielding, native, warm season, perennial grass that produces an abundance of plant biomass and is well suited to Tennessee and the Southeast. As a native species, switchgrass is resistant to many pests and plant diseases, tolerates poor soils, flooding and drought, and can achieve high yields without irrigation and with little use of chemicals or fertilizers.

Currently, switchgrass yields in Tennessee fields are around 6 tons per acre, with some test plots yielding much higher. Current research efforts in switchgrass variety development, genetic modification, and optimizing systems for production, harvest, and management are expected to result in significant yield improvements over the next 5-10 years, in the range of a 12-15 ton per acre yield.

Initially, we expect to produce switchgrass using standard agricultural equipment and production practices, much like current production of hay and other forage crops, again, making it a good fit for Tennessee. We expect to manage switchgrass in a 10-year rotation, with one annual harvest between October and April, baling switchgrass for storage and transport to the biorefinery.

The University of Tennessee and Oak Ridge National Laboratory have a long history of switchgrass research efforts. And while much of the switchgrass research available today is tied to Tennessee, there are still a lot of unanswered questions about how to best optimize the entire energy crop system. Today, half or more of the total costs of cellulosic ethanol production are tied to the production, transport, handling, and pretreatment of switchgrass as it moves from a field crop to an energy feedstock at the mouth of the biorefinery.

In addition to the needed farm level research, the entire proposed switchgrass biorefinery is research focused, and will remain research focused over its life. Researchers from the University of Tennessee, the Oak Ridge National Laboratory, and our industrial and technology partners will focus on research necessary to refine the conversion process, optimize the use of local farm and forest resources, and improve the bottom line to scale-up production and attract commercial investments. The basic goals of the biorefinery are to address all of the questions necessary to make cellulosic ethanol cheaper, scale it up to commercial levels, and develop a plan for smart deployment that benefits all of Tennessee.

As we conduct research to answer these important questions required to produce cellulosic ethanol efficiently and profitably, the Tennessee Biofuels Initiative offers abundant opportunities for our state to capitalize on the creation of intellectual property. Research areas such as pretreatment technologies for cellulosic feedstocks, cellulose biochemistry, biorefinery processes, crop variety development and genetic modification, and field production, harvesting, and pre-processing systems are all ripe for discovery. The Biofuels Initiative will position Tennessee to benefit from development of intellectual property that we can then license throughout the country.

It's not everyday that we have the opportunity to create a totally new manufacturing sector for our economy. Naturally, other states, federal agencies, universities, and private companies are redirecting research efforts and making investments in the biofuels area. But I am convinced that Tennessee is strategically positioned to take a leadership role in the future of cellulosic biofuels. We have a lot of the necessary pieces in place already.

- ***We have*** the farmland and forestland endowment and the favorable growing conditions to produce switchgrass sustainably and profitably in Tennessee.
- ***We have*** willing farmers and landowners, eager to learn more about this brand new opportunity for farm income.
- ***We have*** diverse rural communities, anxious not to prolong economic decline, but to emerge as vibrant hotbeds of economic activity.
- ***We have*** an exceptional state Extension Service, networking science-based research and development at the grassroots level with the farmers and rural communities.
- ***We have*** the basic science capabilities and technologies in place to transform cellulosic material to ethanol today.
- ***We have*** a cadre of bright and driven scientists in the University system, in the Oak Ridge National Laboratory, and in our research partnerships. We are fortunate to have one of the science capitals of the world in our backyard, ready for us to take advantage of in improving the technologies, processes, and the economics.
- ***We have*** genuine excitement about this issue. As research topics go, this one is an easy one to get excited about. Motivated and excited scientists and citizens know no bounds.

We have all of the necessary pieces. **We need** a fully funded Biofuels Initiative that will allow us to put all of the pieces together—farmers, landowners, scientists, rural communities, private industries, state agencies, cooperatives—all working together to realize our bioenergy vision for Tennessee.

Thank you again for the opportunity to appear before you today. Today's hearing on biofuels makes a dramatic statement about the importance this Committee places on accelerating the development of renewable energy and fuels from farmland and forestland within our state. We hope that you will look to the University of Tennessee and our farm, science, and technology partners as you move the State of Tennessee into a leadership position in renewable energy and we look forward to continuing to work together toward this worthy goal. I would be pleased to respond to any questions at the appropriate time.