

Minutes of the Research, Outreach and Economic Development Committee

The University of Tennessee Board of Trustees

**October 21, 2010
Knoxville, Tennessee**

The Research, Outreach and Economic Development Committee of the Board of Trustees of the University of Tennessee met October 21, 2010, in the Shiloh Auditorium of the University Center on the UT Knoxville campus.

I. Call to Order

Mr. Don Stansberry, Chair, called the meeting to order at 8:35 a.m. Mr. Stansberry noted that although the Committee meeting was being held in a public format it was not a public meeting. The Chair will recognize Committee members and Trustees. The business conducted will be according to the agenda. Mr. Stansberry asked Dr. David Millhorn, UT Executive Vice President, to call the roll.

II. Roll Call

Dr. Millhorn called the roll and the following voting members were present:

Mr. Don Stansberry, Chair
Mr. Crawford Gallimore
Ms. Monique Moore Hagler
Mr. Doug Horne
Mr. Jim Murphy
Ms. Betty Ann Tanner
Mr. Sumeet Vaikunth

The following non-voting members were present:

Dr. Dick Gourley
Dr. Karen Johnson
Ms. Sharon Rollins
Dr. Jan Simek

Dr. Boulet, Commissioner Oliver, Commissioner Opie, Dr. Rhoda, and Mr. Turner were absent from the meeting.

Dr. Millhorn declared a quorum present for the meeting.

III. Approval of Minutes of the Last Meeting

Mr. Stansberry noted the first item of business was consideration of the minutes of the previous meeting and asked for any amendments or corrections to the minutes of the June 23, 2010 meeting in Knoxville. There were none. Mr. Stansberry asked for a motion to approve the minutes. Dr. Gourley moved the minutes be approved and Mr. Murphy seconded the motion. No discussion took place. Mr. Stansberry announced the motion carried.

IV. News and Highlights

Mr. Stansberry recognized Dr. Millhorn to give a review of news and highlights of the Committee's activities.

Dr. Millhorn said he would begin the presentation with an update of several projects underway and then would identify new projects. At the previous Committee meeting, Dr. Millhorn noted, Dr. Stacey Patterson (UT Director of Research Partnerships) gave a briefing on the Volunteer State Solar Initiative. This initiative, Dr. Millhorn reminded members, is funded by a Department of Energy grant through one-time AARA funds and is comprised of several components. The \$62.5M funding was split into two parts with: (1) the creation of a Solar Farm in West Tennessee (off I-40 between Brownsville and Memphis) and (2) the creation of the Tennessee Solar Institute, which is in itself comprised of two parts: the Solar Installation Grant Program and the Solar Innovation Grant Program. Considerable progress has been made in this project since the last Board meeting. Dr. Patterson is providing day-to-day oversight to ensure the project stays on track and this oversight has involved work with the community, the Department of Energy, EPA and other organizations.

The objective of the Solar Farm project is the creation of a utility-scale solar power production facility to produce a minimum of 5 MW of electricity. Extensive thought was given to determine the best mechanism to get the produced electricity from the Solar Farm to TVA, which will purchase the electricity. Work is now being planned with the local Chickasaw Electric co-op to upgrade their systems to enable movement of power from the Solar Farm location to connection with the nearest TVA sub-station.

Public education on solar energy is an important aspect of this project and a primary reason the Solar Farm is located where the public can easily see and access it from the Interstate. The Tennessee Department of Transportation (TDOT) will build a new welcome and information center on the Solar Farm site that includes an educational component on solar and other types of renewable energy. The Governor is highly supportive of this program and seeks to continue the state's momentum in renewable energy. The Solar Farm site will be used to demonstrate emerging technologies and will enable comparison of these new technologies with existing technologies. Several large solar companies in Tennessee will use the Solar Farm to demonstrate their own technologies at the center.

This past summer the project design and construction contract was bid, with Signal Energy, LLC out of Chattanooga winning the contract. The design has been approved and construction will begin as soon as DOE sign-off is obtained on the environmental assessment. This process is moving quickly and it is anticipated that construction approval will be granted by the end of November. The Solar Farm construction is anticipated to be a one-year project and must be finished by April 2012 because of the termination of stimulus funds used for the project. A chief component of the Solar Farm project is the contract with TVA to purchase electricity produced at the Farm. Revenues from TVA payments are anticipated to continue the Farm development and to pay for the maintenance of the property and eliminate cost to the University. Dr. Millhorn presented a site-layout drawing of the Solar Farm to give members an idea of the Farm placement, showing the parallel to the Interstate highway, the general relation to surrounding properties, and the planned installation layout of solar panels. The Solar Farm is comprised of approximately 200 acres, allowing growth of the Farm over time if funds are available from the power revenues.

Within the Tennessee Solar Institute is the Solar Opportunity Fund comprised of two parts: the Solar Installation Grant Program and the Solar Innovation Grant Program. There is \$9M within the Solar Installation Grant Program to help businesses install solar devices on or near their facilities. In the Solar Innovation Grant Program, \$14.5M is available to support innovative projects to improve existing

technologies. The Department of Energy was clear that no fundamental research awards can be made within this Fund; only projects aimed at improving existing technologies within Tennessee Companies will be funded. The Solar Installation Grant Program is a reimbursement-based program on existing solar devices. Businesses apply to UT and, if approved, a portion of their solar improvements cost is reimbursed by the DOE funds. This program opened in June 2010. There have been 108 state-wide approved projects (all nine Tennessee Congressional districts have received funds from this program) and the amount of electricity generated from these projects is about 5.8 MW, as much as the Solar Farm generates itself. The Solar Installation Grant Program has leveraged another \$33M of expenditures of solar energy and jobs creation within the state.

The Solar Innovation Grant Program involves six categories of funding ranging from research on existing technologies to workforce development. Over 100 proposals were received. UT will not review the grant proposals. Oak Ridge Associated Universities (ORAU) has been asked to serve as a third-party reviewer and the proposals will be under peer review for merit. Awards are scheduled for a November distribution, with 14 months for project completions.

Mr. Gallimore inquired about possible options on property surrounding the West Tennessee Solar Farm. Dr. Millhorn noted that UT does not have options on the property; however, most of the land is state-controlled and there would be UT involvement in decisions affecting the use of this property. Mr. Stansberry asked about the size range of the commercial-industrial installation projects. Dr. Millhorn responded that a grant application requirement was for any Tennessee companies installing solar. Dr. Patterson noted that the range for the applying companies was between 4.2KW to 400KW. Each company could apply for up to five grants. Examples of companies applying for the grants included mom-pop eateries on up to larger companies such as Sharp's Solar in Memphis. All companies will have dual access or dual-access availability to TVA power. Ms. Loughry asked if the exit from the Interstate to the Solar Farm had been constructed. Using the site layout design, Dr. Millhorn pointed out the Interstate exit now used to access the Solar Farm site. TDOT plans to build a new access road and the public educational center with highway funds. Ms. Blackburn asked for clarification concerning the new access road. Dr. Millhorn said that current access to the Solar Farm is through the east-west exit between mile marker 44-45, which is the Summerville exit, and the exit east of Summerville. The future exit to be constructed by TDOT will allow direct access to the site. Scrub tree removal will allow the Farm to be seen from the highway.

The Solar Farm is designed to attract the "casual traveler," school field-trip groups and other such guests to visit the educational center. Ample parking areas for buses and automobiles are provided in the plans. The educational center will feature highlights of the state's solar and renewable energy initiatives. Private companies will also put in their own displays and exhibits. When visitors leave the educational center, they will leave with the idea that Tennessee is in the forefront of solar energy use and development.

Dr. Millhorn provided an update on the Tennessee Solar Conversion and Storage Using Outreach, Reach and Education (TN-SCORE) initiative. At the June ROED meeting it was announced that UT had been awarded a National Science Foundation (NSF) Experimental Program to Stimulate Competitive Research (EPSCoR) grant in the amount of \$20M over five years. Dr. Millhorn showed photos that were taken at the official press announcement of the award in Nashville with Governor Bredesen, NSF officials and members of the EPSCoR collaborating university officials taken on September 9. There is a lot of excitement about the award because it is the first time a large federal grant involving collaboration with UT, Vanderbilt, Tennessee Board of Regents (TBR), and private universities in the state was successfully awarded. The chief purpose of the grant is to enhance the state's competitiveness in winning more federal grants and awards. The TN-SCORE award will help establish an infrastructure to make the state more effective in bringing in money to the state. NSF made it clear

the award is based upon *excellence in science*. Three scientific-thrust areas have been created--two at UT and one at Vanderbilt--which involve research. Collaborations with community colleges and TBR schools will take place to create outreach programs including summer fellowships for students to work at UT, ORNL, Vanderbilt and other research sites across the state, and to establish mini-sabbaticals for faculty to work at research hubs to learn how to be more competitive in writing grants to bring more educational opportunities and money to Tennessee.

The Afghanistan Project was also given an update by Dr. Millhorn and he reminded members this is a most difficult project. Dr. Millhorn showed photos illustrating challenges for fuel and supply convoys traveling from Pakistan into Afghanistan. There are two main avenues of transport into Afghanistan from Pakistan. One entry was recently blocked by Pakistan because of political issues. Convoys of hundreds of trucks travel into Afghanistan via hostile territories with constant threats by explosive devices, rocket-propelled grenades and other such weapons. The route from Pakistan and from northern countries bordering Afghanistan (such as Uzbekistan, Turkmenistan and Tajikistan) provide the few, difficult routes into/out of Afghanistan to get fuel for military operations and power generation. U.S. servicemen are under extreme pressure to protect these convoys. Most casualties are related to this activity. The Department of Defense (DOD) asked UT to help determine solutions to this situation by creating internal sources of power. The prime focus of this effort was not on liquid fuel but electricity. The villages of Afghanistan do not have electrical sources unless they have generators. There are no available power lines or grid connections and there are also few available natural resources in the country. UT and Genera Energy personnel have collaborated with DOD subsequent to the last ROED meeting and presented a plan allowing at least a preliminary start to resolving the Afghanistan fuel situation. The plan is based around agricultural activity. In addition to poppy crops, wheat is a major crop for the country. Dr. Millhorn presented a graphic of wheat fields in Afghanistan and noted there were no combines harvesting the crop, as workers harvest the crop by hand and put the cut wheat into barrels to cart away for food-production processing. This crude method leaves a substantial amount of biomass in the field. UT/Genera proposed a gasification process to burn the residual biomass and create hot gases to turn turbines to make electricity. This will be done in small-distributing networks due to the absence of power lines and other connections. A fourth of the fuel now imported to Afghanistan is used for power generation and diesel generators. The biomass gasification process will be sufficient to cover the internal power-generation needs. Genera Energy official Louis Buck will be returning to Afghanistan in the near future to assist with these plans.

Mr. Stansberry asked about the cost to deliver a gallon of fuel to the military. Dr. Millhorn said the fully-burden cost (security, transportation and the cost of the actual fuel) is \$400/gallon. Dr. Millhorn noted that besides the fuel cost savings for the military, the prime consideration in this endeavor is saving American lives. The number of casualties continues to climb each day. Dr. Millhorn said he attended memorial services for killed servicemen while he was in Afghanistan last May.

Dr. Millhorn briefed members on the UT Health Science Center-driven Clinical and Translational Science Institute (CTSI) proposal through a National Institutes of Health (NIH) Clinical and Translational Science Award (CTSA) application. The purpose of the awards is given in the NIH statement of purpose: "A national consortium of medical research institutions, funded through Clinical and Translational Science Awards (CTSA), is working together to improve the way biomedical research is conducted nationwide. Consortium members share a common vision to reduce the time it takes for laboratory discoveries to become treatments for patients, to engage communities in clinical research efforts and to train clinical and translational researchers."

This is a large program within NIH. A total of 62 awards will be made (five new awards will be made in 2011). UTHSC submitted an award application in October. Dr. Millhorn reviewed the application

(approximately 250 pages) and it is excellent. Dr. Jim Dale is the principal investigator (PI) and did a remarkable job not only in writing the proposal but also in bringing it together, along with Dr. Schwab and his team, with the academic, clinical and community organizations involved in support of the proposal (such as St. Jude Children's Research Hospital, the University of Memphis, Le Bonheur Children's Hospital and the Memphis Research Consortium). It is important for UT to win this award, Dr. Millhorn said. To support the proposal, Dr. Millhorn and Interim President Simek agreed to enable CSTI to recruit and retain a world-class expert in health informatics by committing a prestigious Governor's Chair position for this appointment. This award will be an important link and can become an even stronger link for UTHSC, St. Jude and ORNL. The award is for slightly more than \$20M over five years and is renewable. It is most important for UT to become a member of this "club" of institutions and participate in clinical studies with NIH and with the private sector.

Mr. Schledwitz noted the importance of the award and the amount of work that was done during the proposal process. He asked Dr. Millhorn what was done differently in this attempt to prepare for and to enhance the proposal in comparison to the previous proposal attempt several years ago. Dr. Millhorn said he read the last application and thought it was fairly average. After studying the recent proposal, he believes it to be exceptional. The chief differences, Dr. Millhorn noted, were the way the current proposal was written and in the concrete partnerships that were formed featuring vital activities and demonstrating administrative support in the financial commitments for buildings and positions within the proposal. The vision of the proposal objectives is firm, with a concentration on the large number of health problems in the Memphis and Delta regions, including heart attacks, diabetes, obesity, maternal health and infant deaths. Dr. Millhorn's strategy, which he conveyed to Dr. Dale and others, was to make the NIH feel guilty if it did not make the grant award to CTSI. Ms. Blackburn asked about the level of competition for the award. Dr. Millhorn noted there are approximately 130 medical schools in the country and an award will be made to less than half this group. He believes Memphis should be in the award group due to its unique health situations. Mr. Stansberry inquired about the timeframe for the announcement of the award and Dr. Schwab said that this would likely occur in April 2011.

V. Cherokee Farm Update

Dr. Millhorn showed a brief audio-video presentation on Cherokee Farm developed by Ms. Kim Holbrook and Dr. Stacey Patterson depicting where the Cherokee Farm site has been, where it is today and where it is going and needs to go in the future. The Native American music in the presentation alludes to the heritage of the property, Dr. Millhorn noted. Dr. Millhorn said much activity is now taking place at the site. Until this point in the process, much time has been devoted to preparation and in conducting surveys. The development phase is now beginning for the construction of a very special place. Attention is being given to developing marketing strategies to bring private investment into the plans. Dr. Millhorn presented slides of the property when it housed UT dairy facilities. These buildings have been demolished and grading has begun on the site. This land was identified as being ideal for building a research campus to highlight innovation and excellence. The first part of the project involved input from organizations such as the UT Archaeological Research Lab to identify any Cherokee or pre-Cherokee Indian artifacts that might be present on the property.

EDAW, an Atlanta-based company, conducted a feasibility study of the project and gave UT an A+, indicating Cherokee Farm is one of the most remarkable projects with which they have had the privilege to work, referring not only to the actual site but to the proximity of UT and ORNL and within a community and state that is progressive in its economic development pursuits. Gresham, Smith & Partners was selected to conduct a Phase I and II environmental and natural resources site assessment and to prepare a development concept and infrastructure design plan, and these activities are now taking place on the property. Wilbur Smith Associates was brought in by TDOT to prepare a traffic

study for the site. TDOT has plans (no time table has been finalized) to reconstruct Alcoa Highway from the Buck Karnes Bridge to McGhee Tyson Airport, particularly to improve access at Cherokee Farm and the UT Medical Center. Barber McMurry Architects were selected to design the first building at Cherokee Farm, the Joint Institute for Advanced Materials (JIAM).

Dr. Millhorn presented a design of the development concept. Three major research clusters are planned with parking areas. There is a possibility that a hotel-conference center will be constructed with private funds on the site. Dr. Millhorn indicated the area surrounding the lower part of the property that will not be used for development. This is an archaeological-rich area that is also part of a flood plain. There are approximately 77 acres available to build upon and maintain a nice environment on the site, with approximately 17 buildings and 2M square feet of research space. Mr. Horne asked about the funds appropriated for the project and Dr. Millhorn responded this amount was \$32M. When asked what the future requirement might be in additional funds or if this site would accommodate the UT President's Office, Dr. Millhorn noted that discussions had taken place with Dr. Simek and other UT leaders concerning the move of the President's Office to the Cherokee Farm site. Dr. Millhorn noted that about three years ago when UT asked the legislature for funds to put in the Cherokee Farm infrastructure, it was estimated that it would take \$32M for this aspect of the project. Actual bids received were around \$12M. This amount and other potential costs of putting in the infrastructure will likely leave a balance of \$10M from the infrastructure allotment to put toward construction of a system administrative office building and the associated move to this site. Such a facility will need to be about 75,000 square feet of gross space or about 45,000 square feet of net space to accommodate offices and meeting rooms, as well as space for visiting business associates coming to the property. System employees in the downtown UT Conference Center as well as on-campus system personnel could be moved to this site. Locating the system offices to Cherokee Farm appears to be a workable plan at this point. Cost of such a facility would likely be \$15-20M. In addition to due-diligence work on the plan, approval from the State Building Commission will also be required for the project. Mr. Murphy noted that care should be taken for the system building not to impact viable research space. Dr. Millhorn said the tentative location of the system building was along the front of Alcoa Highway, where there is a higher level of traffic vibration and the building would actually serve as a buffer to other buildings where sensitive research is taking place. Also, there is good central parking for the system location. Dr. Millhorn noted that careful planning is going into all aspects of the Cherokee Farm project. Dr. Simek stressed, as did Dr. Millhorn, the plans to locate the system offices at Cherokee Farm are most preliminary. The move will involve a large group of employees and adequate space is a pertinent factor in this decision.

On a graphic Dr. Millhorn indicated a small building in the lower area of the site that is tentatively designed as an Interpretative Center. This facility will be dedicated to the archaeological laboratory to conduct more research on the Cherokee natives who once lived on the property.

Two-thirds to three-fourths of the shown concept buildings will be constructed with private money. Dr. Millhorn has spoken with a number of companies that have expressed an interest in this development. At present the interested parties do not want their names publicized, but their interest is becoming more serious as site development progresses. There is a significant drawing card, Dr. Millhorn said, with the site proximity to the University and Oak Ridge National Laboratory. This proximity enables a unique opportunity for collaborations and partnerships.

A master plan and development guidelines have been formulated for the Cherokee Farm campus and the State Building Commission has approved the plans. It was important to memorialize the guidelines to prevent slippage from the initial vision. Planning principles were developed by a large group involving community leaders, faculty, potential investors, and state and local government officials. The principles include: emphasize design excellence and innovation through the campus (no

manufacturing; hard research and development only); integrate sustainable design strategies in all aspects of campus development (focusing on environmental and energy-efficient operations); foster a spirit of collaboration and collegiality across the campus through a well-defined, pedestrian-friendly and comfortable public realm; honor the site's rich history and potential as a cultural resource; and connect the campus to the city and region through multiple modes of transportation and public spaces.

Slides were shown of Cherokee Farm as it appears today with infrastructure development taking place. A large amount of dirt has been moved and preparation of two building sites is taking place. In some places topsoil was 9' feet deep and this soil had to be removed. Some of the rich topsoil will be reused on the property, some will be stored for future use, and some of the topsoil will be used at other UT properties. Dr. Millhorn noted the beauty of the Cherokee Farm site depicted in the slides.

Priorities for Cherokee Farm are now being developed. One such priority is developing a marketing strategy. Ms. Kim Holbrook, a former Eastman employee and now a part-time employee in the Executive Vice President Office at UT, is helping with this process. Marketing strategy development is following benchmarking best practices, focusing on unique qualities, creating a strong brand and implementing a multi-phase marketing campaign. Within this process questions are being asked, such as: how do we reach out to other companies, what are companies looking for, how do we distinguish ourselves, how do we make ourselves unique? When the phrase "research triangle park" is heard, people immediately think of North Carolina. We want to think "strong brand" here with "Cherokee Farm" where people think Tennessee and the University of Tennessee.

Another development priority is the establishment of strategic partnerships which emphasize Tennessee partnerships in both the public and private domain. Cherokee Farm should be the #1 partner of the Economic Development Corporation. When companies are brought to this region, we need to be a key part of the visit. We need to be working with the Chambers of Commerce all over the region to ensure we are reaching anyone involved with the recruitment of companies into the area. A further priority is the recruitment of tenants and talent to occupy the Cherokee Farm site. There will be thoughtful selection of tenants housed at the site to select those who contribute to the spirit of research excellence and innovation and parallel that taking place at the University and ORNL in order to form productive, quality partnerships to pursue regional, national and international opportunities. This approach will lead to sustainability and interaction.

Mr. Horne asked, if he was representing a private company and desired to buy a fee simple in Cherokee Farm, what restrictions would there be and how would this agreement work if he could not buy a fee simple lease? Dr. Millhorn noted work is being done with the State Building Commission (SBC) to set up long-term leases (50-year land leases) that can be renewed. He indicated that UT CFO Butch Peccolo could address this topic more precisely. Dr. Millhorn said that at this time a lease is being reviewed that will allow a tenant at Cherokee Farm to select his own architect and construction company but land ownership is with the state. Mr. Horne asked how the lease will be priced. Dr. Millhorn said the property is evaluated and the price of the lease depends on the value of the property. Work is being done with the SBC to study this type of lease. Mr. Horne asked if the state could be asked to make it cheaper for the first tenants going in on the site and Dr. Millhorn agreed this approach would serve as an incentive to occupy the property, much as tax incentives are given under certain conditions. This process will likely need to be done individually as each tenant comes to the property. Mr. Horne asked if he, as a tenant, would be getting a graded, utility pad-ready, complete infrastructure-developed site and Dr. Millhorn said this would be the case and this activity is taking place now at the property. Mr. Stansberry asked if the property lease would be a restricted lease to protect the planning principles and contribute to the research and education premises previously outlined and Dr. Millhorn said that it would be. Dr. Millhorn emphasized that quality tenants, those

who will add value and improvement to Cherokee Farm, are the recruitment targets of the project. The bottom-line is that both parties want added-value—“we’re better because you are here and you’re better because we’re here.”

Dr. Millhorn concluded his presentation by discussing the “tomorrow” plans for the project. He showed a slide of the Joint Institute for Advanced Materials (JIAM) facility. This research building has been designed and programmed to be as environmentally friendly and energy efficient as possible. It will go out on bid within the next few weeks (November or December 2010) with construction beginning in the spring of 2011, with approximately 44 months to build the structure. Dr. Millhorn showed on the drawings how the buildings have been laid out to integrate research and business groups and to accommodate recreational activities as well. The project is moving forward at a steady rate. It is believed this project will rebrand the entire community. Cherokee Farm will be seen first by those coming into Knoxville from the airport. It will deliver a high-level “wow!” factor—what is this impressive complex and what happens at this site.

Why is Cherokee Farm important? Dr. Millhorn said it is an opportunity to participate in and to lead major research initiatives. Every effort is being made to create quality partnerships with both private and public organizations to work together to solve problems of national significance (energy, biomedical, health care, defense, environmental). The vision is to bring distinction to the University, region and state by increasing UT’s research funding base; leveraging unique capabilities, faculty, science and technologies; creating competitive advantage; growing Tennessee’s economic development with existing businesses; and attracting new businesses to locate to Tennessee. When the state is successful, there is more revenue available for UT. This initiative is important for job creation in Tennessee—to bring in high-quality jobs, to provide real-world training for UT students, and to recruit and retain top talent. There is a huge impact of this project in stimulating the state economy, in providing capital investment for the state and in attracting other investment opportunities for community development. Cherokee Farm gives UT an opportunity to be a major player in these endeavors.

How can you help? Commit to the project, Dr. Millhorn said. Commit and connect not only with UT but with state friends in spreading the news about this major initiative. Champion the Cherokee Farm cause. The University needs champions and Cherokee Farm needs champions. Mr. Stansberry thanked Dr. Millhorn for his presentation. Mr. Wharton also thanked Dr. Millhorn for making an excellent presentation. Dr. Millhorn noted it is easy to get excited about Cherokee Farm because it will have a remarkable, long-term impact on the University.

VI. Center for Renewable Carbon

Mr. Stansberry asked Dr. Joe DiPietro, Chancellor of the UT Institute of Agriculture, to give his presentation on the Center for Renewable Carbon (CRC). Dr. DiPietro noted that it’s a new day for industry and a major shift is now underway as the world moves from a hydrocarbon (petroleum)-based economy to one based on carbohydrates from agriculture and forests. Renewable carbon is the structural biomass (non-food) component produced from photosynthesis (lignocellulose). Renewable carbon encompasses the many terms we often hear these days: biomass, biofuels, biopower, bioproducts, biochemicals, and biomaterials. “Renewable carbon” is “edgy” science--it helps the UT Institute of Agriculture be set apart from other universities. UT is ahead of the game in this science. Most major universities are now developing bioenergy programs; however, none that Dr. DiPietro knows of has coined this “renewable carbon” descriptor for this particular group of sciences.

The target market for renewable carbon is big. Today petroleum supplies more than a third of the world’s energy and supplies 96 percent of all transportation needs. According to the International

Energy Agency (IEA) and the Department of Energy (DOE) models, this dependence on petroleum is a growing concern. Dr. DiPietro presented a graph indicating IEA's world petroleum supply and demand which showed a widening gap between world petroleum supply and demand over the next few decades. Using a 2 percent annual demand growth curve and a 7 percent production decline curve results in a shortage that will require six new Saudi Arabias to fill the gap by 2030. Even if no demand growth is assumed (not likely given China and India's projections) and a very conservative 4 percent annual production decline, four to five new Saudi Arabias would be needed to fill the shortage. Not only is the renewable fuel market big, Dr. DiPietro stated, it is largely our market to supply. According to a roadmap published by the USDA this summer that shows the path for meeting the current renewable fuel federal mandates, the Southeast will have the lion's share of this market. This roadmap indicates 50 percent of all advanced biofuels produced in the U.S. will be from the Southeast.

Dr. DiPietro stated that not only are the right things being done in Tennessee, Tennessee is uniquely positioned because of our advantage to grow the pertinent types of crops and materials. In addition, this huge market centered in the Southeast has a big investment attached. In a USDA report, 50 percent of all biofuels produced in the Southeast will require nearly \$84B to build the 263 biorefineries needed to be built between now and 2022. With the most robust growing season in the U.S., the Southeast is projected to have 9.5M acres in biomass production for fuel by 2022. Clearly, Tennessee is well-positioned for this growing market. While the cellulosic biofuels supplement to petroleum is our biggest near-term opportunity—here today, ready to go—this is a dynamic opportunity with diverse markets to serve. Moving forward, biochemicals, bioproducts and biomaterials are equally big (or bigger) opportunities. Bloomberg New Energy Finance forecasts 2010 total new clean energy investment at \$180-200B just for this year. With that level of investment, we are on the verge of seeing disruptive technologies that completely change the dynamics for renewable carbon. We cannot predict exactly what the renewable carbon industry will look like in five or ten years, Dr. DiPietro stated, but we know we're heading in the right direction. Dr. DiPietro noted that he expects when we look back at our current position, it will be like comparing the 1980s bulky high-tech bag car phone and today's hand-held multi-media phone-computers with a 10 MP camera and HD video.

The CRC positions UT and UTIA to be competitive as technology and the landscape evolve. The CRC gives us a new model to meet the dynamic market and technology challenges ahead. Dr. Tim Rials, the director of the CRC, often says, "The world has problems ... and the University has departments." Big problems like creating domestic, sustainable, clean, renewable energy require big and comprehensive solutions. No one department can solve them. This renewable energy problem is an opportunity to bring scientists from a number of disciplines together under one umbrella to address a common problem. And, by having plant geneticists working with biosystems engineers, economists and chemists, we create an opportunity for synergies to build that we wouldn't have if we were doing research and business as usual. We also need to integrate across functions, Dr. DiPietro said, integrating our cutting-edge research with innovative teaching and outreach programs. Support for these researchers and educators with cross-cutting support services including business, policy and IP protection and ecological sustainability is crucial. This collaboration positions us to better utilize our existing infrastructure and resources and it positions us to approach big problems in a businesslike manner that facilitates smoother partnerships with private industry, ORNL and other institutions. We have to make ourselves an attractive, assessable partner.

For a Top 25 University to meet the top challenges of the next decade and generation, Dr. DiPietro said, we need cutting-edge programs that give our scientists a competitive edge. UT and UTIA have been able to leverage existing and new resources to build world-class capacity to support our integrated renewable carbon programs. We have re-commissioned the Forest Products Center as the Center for Renewable Carbon; however, the forest products industry is not being left behind. The forest products industry has begun to see biobased-energy, fuels, power, materials and products as a

new, expanded opportunity. Some of the underutilized space behind the existing CRC has been used to create a state-of-the-art BioEnergy Science and Technology (BEST) Lab. This space is nearly ready for occupancy and will bring together research laboratories in the renewable carbon space that today are spread around the campus.

Dr. DiPietro noted that UT/UTIA has a great set of world-class assets now in Vonore with its biorefinery, particularly the Process Development Unit and the new Biomass Innovation Park, on which Dr. Kelly Tiller will provide an update following his presentation. The network of farms growing switchgrass around the biorefinery is viewed as a valuable field laboratory. It is the largest and most comprehensive energy crop demonstration in the U.S. and it's in UT's backyard. The Plant Science Research Education Center in Knoxville is only one of two certified plots in the country for doing genetically-modified switchgrass field trials. Our engineering labs for pre-processing biomass—otherwise known as “Dr. Al's Garage,” for Dr. Al Womack—have unique capabilities for handling biomass that are not found anywhere else in the U.S. They are working on aspects such as finding the most efficient way of handling switchgrass in compacting, moving and preparing it for various applications. The full-scale pellet mill across the river at JARTU has been a huge asset in capitalizing on such logistics and in studying the pelletization of switchgrass.

Ms. Loughry asked Dr. DiPietro to clarify where the BEST lab is located on the Ag Campus. Dr. DiPietro noted that a former plot barn no longer needed was remodeled to house the lab. It is directly behind the Forest Products Center (Dr. DiPietro showed a graphic of the facility). Mr. Gallimore asked what the economic performance is of switchgrass to the farmer. Dr. DiPietro said the initial contracts provide the grower about \$450/acre gross if they can produce 8 tons per acre. After the first year getting the switchgrass crop established in the ground (\$200-250/acre cost, largely for seed) with only about 25 percent of full yield, the economics improve as the farmer's maintenance costs decline and his returns increase as yields increase. After the first year the annual maintenance cost, even on marginal ground, is minimal. The first year establishment cost can be amortized over a ten-year period. Mr. Wharton asked about the competitive nature of the \$450/acre switchgrass crops to other crops such as beans, corn and wheat and asked if only marginal land was used for growing switchgrass. Dr. DiPietro noted that the switchgrass commodity will not compete with major food crops or crops grown on highly-productive, row-crop acreage in Tennessee.

Dr. DiPietro said the world-class team in place is why the CRC and biofuels initiatives are where they are today. As evidence of the team's value, UT's Dr. Kelly Tiller and Dr. Tim Rials were listed last week in the 2010 list of the “100 Most Influential People in Bioenergy.” They are in good company with people like the Secretaries of Agriculture and Energy, CEOs of Fortune 500 Companies, the country's leading venture capital and private equity fund managers, key senators, and Tennessee's Governor Phil Bredesen. There were only a handful of academics on this list; all the rest were from leading research universities, and most of them were universities affiliated with national laboratories. Dr. DiPietro read comments from *Biofuels Digest* about the selection of the trio (Bredesen, Tiller and Rials) from Tennessee: “One of the biggest write-in votes we had was for this trio, instrumental in the establishment and growth of Genera Energy. It's likely to be the most important feedstock play in the next couple of years--intended to benefit Tennessee, but pioneering models for the global industry as a whole. Shows that readers know more than nominators.” Dr. DiPietro also noted that Dr. Joe Bozell (UT Professor in Forestry, Wildlife & Fisheries) is responsible for the seminal work in bio-based chemicals known as the “Top 10 Biochemicals” report. Other notable recognition includes the POLYSYS model out of UT's Ag Economics Department which has been a major influence on biofuels policy and is the primary model in use today by DOE, USDA and others. Several of UT/UTIA researchers have contributed to the joint DOE/USDA premier report, the “Billion Ton Study” that charts the course for the renewable energy industry. Dr. Neal Stewart's plant genetics labs and programs are internationally recognized. Dr. Daniel Ugarte's work and reputation in bioenergy has led

him to a sabbatical in Geneva, Switzerland to work with the United Nations Conference on Trade and Development on bioenergy issues. UT's reputation is also helping us recruit new talent such as Dr. Darrin Bakker, a young hot-shot chemist bringing a wealth of lignin carbon fiber intellectual property with him. Last spring when the USDA and Farm Foundation planned their first Biomass Field Day to be held in November to gather several hundred key agency personnel together to bring them up-to-speed in biomass and bioenergy, the CRC was selected to host this three-day meeting in Knoxville and Vonore, showcasing our faculty and facilities and educating key agency decision-makers and policy leaders.

Dr. DiPietro presented the vision and mission of the UTIA Bioenergy program: Vision—The University of Tennessee Institute of Agriculture will be the national and international leader in cellulosic bioenergy and bioproducts research, education and outreach; Mission—The mission of the UT Institute of Agriculture Bioenergy Program is to enhance economic and environmental sustainability and reduce dependence on important fossil fuels and petroleum-based products through research, education, and outreach programs on bioenergy and biobased, non-food energy sources. Dr. DiPietro said the energy that drives these programs is the faculty. Success in such efforts cannot occur without engaging the faculty in the planning and development process. The process included forming a faculty advisory group to develop a plan, cultivating departmental and faculty buy-in and opportunity awareness, selecting a CRC director (Dr. Tim Rials), and rolling-out the program and educating people about it.

The CRC is fortunate in building on a number of successful UT/UTIA enterprises, Dr. DiPietro noted. The UT Biofuels Initiative (UTBI) is a Tennessee-funded program to demonstrate the technical and economic feasibility of cellulosic fuels; it involves a partnership among UT, Genera Energy, and DuPont-Danisco Cellulosic Ethanol (DDCE). The Sun Grant Initiative is a multi-faceted program to accelerate development of alternative energy from renewable carbon sources and is administered by Oregon State University, South Dakota State University, Oklahoma State University, Cornell, and the University of Tennessee. It partners with agencies including the Department of Transportation, DOE and USDA. The Wood Utilization Research program is a USDA-sponsored program to support research and development innovations in wood and related material systems to improve the competitive position of the forest products industry. The program is conducted by fourteen land-grant universities across the nation, including the University of Tennessee. The Bioenergy Production and Carbon Cycling program is a USDA-sponsored program to assess the effect of land-use history on soil carbon sequestration and below-ground ecology of switchgrass production. The impact of bio-char from different sources on productivity is under exploration within this program.

UT/UTIA has a new \$5M DOE award for high-bulk density handling systems for switchgrass, a \$2.4M DOE Biomass R&D Initiative award demonstrating 1,000 acres of improved switchgrass varieties, a \$1M USDA bioenergy education award to develop graduate curriculum through BioSUCCEED (an online program), and a \$1M DOE Biomass Feedstock Partnership award for designated lead for short-rotation woody crops. In addition, Dr. DiPietro said, UT/UTIA is further uniquely positioned to succeed as it currently is the lead institution for a \$45M proposal for USDA-funded Southeast Biomass Center. This competition is down to a few finalists. UT has a strong proposal with fourteen excellent private/public partners. UT is also in the final round for a \$5M bioenergy education program grant. Dr. DiPietro noted that education must be tied to the research side of the program. He predicts the renewable carbon industry will expand and there will be strong demand for students coming out of our programs with degrees that are applicable as well as enabling students who want to "retool" under this program. CRC has two USDA-DOE Bioenergy R&D proposals pending, about \$6.5M each. There are growing partnerships with private companies such as Deere, DDCE, DuPont, Genencor, Case New Holland, TVA, Farm Bureau, Ceres, Arbogen, ORNL, AGCO, Vermeer, Perkin-Elmer, Proton Power, Bamert Seed, and Blade Energy Crops.

Mr. Wharton asked where the \$45M proposal for a USDA-funded Southeast Biomass Center would be located. Dr. DiPietro said it would be in existing facilities on the UTIA campus.

Dr. DiPietro concluded his presentation to reiterate that the renewable carbon field is moving fast. The CRC is out in front today as evidenced by what others are saying about Tennessee. He said it is not enough to keep the pace; we intend to lead the pack. We are not trend watchers; we are trend setters. Dr. DiPietro said he was mindful of the old Dave Clark song, "Catch Us If You Can"—you have to run hard and fast to beat us at UT! We are working to make sure no one catches us. UT is out front and that's where we should be.

Mr. Stansberry thanked Dr. DiPietro for his excellent presentation.

VII. Biofuels Initiative/Biomass Innovation Park

Mr. Stansberry noted this agenda item continues the theme of Dr. DiPietro's presentation. He introduced Dr. Kelly Tiller, President of Genera Energy, to give the Biofuels Initiative and Biomass Innovation Park presentation. Dr. Tiller noted exciting initiatives are taking place in the field of bioenergy and she wished to provide an "taking stock" update on recent progress and developments. Before this update, however, Dr. Tiller showed a slide she had shown the members at their meeting in March 2008 giving the four UT Biofuels Initiative (UTBI) objectives: (1) demonstrate the establishment of a dedicated biomass energy crop supply chain with farmers; (2) demonstrate the pre-commercial production of ethanol from switchgrass; (3) establish premier long-term research capability in bioenergy and bioproducts; and (4) (if the first three objects were accomplished) develop a viable, sustainable, long-term path to commercialization of cellulosic biofuels in Tennessee. The UTBI has had a \$70.5M "checkbook" commitment to start the initiative (now at year 3 of 5 years) and most of these funds have been received.

The first objective addressed, the establishment of a demonstration scale biorefinery, Dr. Tiller said she is pleased to say, is successfully operational in Vonore. Genera Energy LLC now has the distinction of operating the country's first demonstration-scale biorefinery to convert both agricultural residues and dedicated energy crops to ethanol. Genera Energy has a terrific partner in this enterprise, DuPont Danisco Cellulosic Ethanol LLC (DDCE). The partnership has taken the \$36.7M state investment in the biorefinery and has now leveraged it to generate more than \$70M in private investment for biorefinery construction and commitments for ongoing operations. Dr. Tiller noted that a number of Committee members and UT officials attended the grand-opening ceremony for the facility in January of this year. Dr. Tiller showed slides of the 75,000 square foot state-of-the-art facility located on a 32-acre site in Vonore, TN, at the Niles Ferry Industrial Park. A unique feature of the facility is that it is not a pilot-scale in terms of taking what is done in the labs and scaling it up; the Vonore biorefinery is actually a scaled-down version of a full-commercial scale facility in design. Consequently, although it is a much smaller production-out operation, it has more than 4,000 input-output points resulting in a large number of data points and that provide great benefits in terms of long-term development of a commercial-scale biorefinery.

Dr. Tiller showed a slide outlining the DDCE proprietary conversion technology process and described the steps involved. With respect to Intellectual Property (IP), DDCE brought with them pre-treatment technology, or the technology for first steps in breaking down the plant material, particularly in opening the polymers with enzymes—the "magic bugs." During enzymatic hydrolysis (or saccharification), Genencor-developed enzymes break down cellulose and hemicelluloses into component sugars. DuPont-developed fermentation technology converts sugars to alcohol. This alcohol is distilled into fuel-grade ethanol and co-products are recovered. This is the "DDCE" proprietary part of the process. Up to 87 gallons of ethanol per ton of material is being produced

today. Both five- and six-carbon sugars are being converted. As recently as 2009, the Department of Energy (DOE) projections were that no technology would be able to commercially process both five- and six-carbon sugars until 2030. This undertaking is being done today in Vonore, with cutting-edge technology and our good industry-leading partner, DDCE.

Dr. Tiller noted that a large segment of the total process and over half the total cost of ethanol production, however, occurs before biomass enters the facility. Thus, there is a wide area available here for IP as well as a huge market to serve the biomass production, harvest/handling/storage, pre-processing and transportation stages to the ethanol-production facility. This area is a large focus of the biofuels program and it will continue to be a major research focus area for the university as the state-funded components of the Biofuels Initiative ramp down. Another emphasis, Dr. Tiller noted, is on the lignin produced in the conversion process. Approximately 20 to 25 percent of front-end biomass does not make its way out as ethanol and advanced fuels to load in the delivery trucks. Lignin falls in this area. It is a co-product that is the fibrous part of the plant and it is more expensive to extract sugars out of this substance. Lignin is a huge resource, with a multitude of uses and many IP opportunities.

The second objective of the UTBI focus is the establishment of a dedicated biomass energy crop supply chain with the farmer. As Dr. DiPietro mentioned earlier, Dr. Tiller said, Genera Energy now has the country's largest and most comprehensive network of energy crops. These are contracted with 60 local farmers, all within a 50-mile radius of the biorefinery, and they have more than 5,200 acres of switchgrass in production today. Dr. Tiller noted that the "supply chain" is a critical aspect of the production process. It isn't just about "growing" the material; the product has to get from the field to where it's needed and meet the specifications of the biorefinery. There is much that must happen in terms of handling, storage, transportation, drying, chopping, grinding, milling, sorting, aggregating, marketing and other such functions. All of these activities are interdependent, resulting in a highly integrated biomass supply chain.

The UTBI is in its third year of contracting, Dr. Tiller noted, and switchgrass has exceeded the expectations of production and the bar continues to be raised. An average yield is now about 8 tons per acre and third-year switchgrass will begin harvesting in about three weeks (usually November-February in Tennessee). It is harvested only once a year, after the first killing frost, which allows nutrients to move back down into the root system. Research shows that carbon not only moves into the roots, it also moves out into the soil. It's a tremendous opportunity to sequester carbon above what is being taken into the biomass. A focus in this process is to make sure farmers have the widest variety possible in portfolio uses of this material to help their bottom-line and make them more competitive.

Switchgrass can be used as a forage crop early in the growing season, allowing cattle to be turned out on the land and grazed. Significant wildlife benefits have been confirmed with switchgrass production. Quail are returning to the area in large numbers in some fields. Mr. Wharton asked what happens to the quail when the switchgrass is harvested and the quail lose their cover. Dr. Tiller noted that the switchgrass is harvested at a minimum height of six inches and border strips and clumping-corridor tunnels are left to allow the quail to travel during the harvesting season. When managing switchgrass for dual energy and wildlife benefits, leaving buffer strips unharvested may provide a balance of the two uses.

The contracts that UT and Genera have with more than 60 farmers have evolved over the three-year program, moving toward a more market-oriented contract this year. The initial contracts issued in 2008 by UT offered a fixed price over three years, paying \$450/acre per year for three years. Now, in the third-year round of contracting, the contracts are with Genera Energy and they have moved to a

combination of a fixed per-acre payment for the first year of establishing the crop that declines in the second and third year and a yield-based payment that ramps up in the second and third years. Contracts are also in place with some of the farmers to store the biomass material on their farms, while some is stored at central storage sites. Switchgrass crops are averaging about 8 dry tons per acre by the third year, with as many as 10-12 tons on some of the acreage (even 19-20 tons in some isolated research plots with experimental varieties, although those have not been in Tennessee). This past year a DOE grant was awarded to demonstrate 1,000 acres of two improved varieties of switchgrass. Certainly, the Tennessee switchgrass experience is moving along very well, Dr. Tiller said.

A map was shown of the switchgrass contract farm sites showing their location and year of contract (2008, 2009 or 2010). Dr. Tiller noted these farms are a tremendous education and research tool not only for UT/Genera but for other research teams as well in looking at R&D issues, environmental and ecological impacts, carbon sequestration data, agronomic issues, and supply chain and business modeling. Exploration of a new seed industry is being developed around this activity as well. The UT switchgrass program is of huge value for researchers and educators around the world.

The third UTBI objective of establishing a premier long-term research capability in bioenergy and bioproducts, Dr. Tiller said, has been addressed in the creation of a world-class R&D capacity, as Dr. DiPietro previously noted in his presentation. The UTBI has successfully leveraged state and University investments, with more than \$8M to date awarded in competitive federal funds for biofuels programs and \$50M pending, including the previously noted \$45M USDA proposal. Another huge research asset to the UTBI, integrated with the supply chain, is the development of a world-class Biomass Innovation Park to scale up and optimize biomass supply chains, including material receiving, handling, storage, pre-processing, screening, densification and logistics. The Biomass Innovation Park is scheduled for completion in 2011. Dr. Tiller presented a slide showing a storage area for the biomass material that contained more than 2,400 large, round, half-ton bales of switchgrass. In a commercial-scale facility, this amount of switchgrass would provide only a 24-hour supply of biomass material. This is a huge amount of material to manage for ethanol production. Tremendous progress is being made in improving the efficiencies of biomass supply-chain management and in doing it cost-effectively. One key is to increase bulk density with the product. UTBI now has a \$5M DOE grant that is allowing the demonstration of a high tonnage bulk-handling system for switchgrass. The grant allows research on an alternative handling system that would chop the material in the field and move it all the way to the biorefinery in a high-density bulk form instead of bales. Every time a bale is touched--whether it is to move it from the field, load it on the truck, or move it on to the other points--costs are added. Mr. Wharton asked if square bales of about 1,200 pounds would allow for easier stacking. Dr. Tiller noted a bale study has been conducted where some of the switchgrass was harvested into square bales and some into round bales. The square bales are more sponge-like and stack better, whereas the round bales have an outer protective layer that allows for better weathering. There is a huge opportunity in this bulk process to bring in private partners. In the next month world-class companies such as John Deere, Case New Holland, Vermeer, and Bale Tech are bringing in over 60 pieces of their state-of-the-art equipment to test. One new technology from Transload America forms a compressed bale completely encased in plastic wrap that may weigh as much as three tons per bale. While this technology was developed for material handling in the garbage industry, applying it to this new biomass industry provides huge R&D opportunities and UTBI is well-positioned to participate and lead in these activities.

Getting the baled or field-chopped material into the flour-like form it needs to be to go into the biorefinery is the function of the new Tennessee Biomass Innovation Park in Vonore. A ground-breaking event for the Park took place this past July. The Park is on a 22-acre parcel that is adjacent to the biorefinery, and it operates as a one-of-a-kind, world-class research hub that brings together material receiving, handling, conveyance, chopping, grinding, storing, densification, pre-processing,

screening and analysis, plant genetics, and other such functions. Dr. Tiller noted some of the assets used for the Biomass Innovation Park included the \$5M DOE-funded high-tonnage bulk handling demonstration grant. Two silos shown at the site are each 99 feet high and 60 feet in diameter, to give a sense of proportion of the Park. There is space on the site for development and strategic partnering opportunities to demonstrate new technologies.

The Biomass Innovation Park Phase I (receiving and storage) is to be completed by the end of 2010. Phases II and III (processing and DOE-funded high-tonnage switchgrass bulk handling system) are to be completed by the second quarter of 2011, in line with the DOE grant. Dr. Tiller noted opportunities to expand and add even more value to the project, especially to the farm level. A biorefinery wants sugar. If the high-value sugars can be separated out earlier in the process and sent to the biorefinery, the rest of the fiber can go to power production or other kinds of uses and the economic value will increase for everyone. Dr. Tiller briefly reviewed the UT Center for Renewable Carbon (CRC) as the umbrella for coordinating R&D in renewable carbon systems, creating new conversion technology, supporting technology demonstrations, educating and training the new workforce and transferring science and technology to a broad client base. There is much opportunity, Dr. Tiller said, with co-products and materials within the CRC research. An important aspect is sustainable production to ensure economic longevity and environmental safeguards.

Dr. Tiller provided highlights of UTBI direct benefits to UT and UTRF that are occurring today and within the next few years that leverage the \$70.5M investment from the state. Biorefinery assets (land, buildings, equipment), with an expected life/maturity date of 25 years, has a low fair-market value of \$37M and high-fair market value of \$55M. The partnership with DuPont Danisco Cellulosic Ethanol (DDCE) for operation of the biorefinery and PDU, with an expected life/maturity date of 10 years (plus two 5-year extensions), has a low fair-market value of \$30M and a high fair-market value of \$100M. Potential success fees from DDCE commercial licenses, with an expected life/maturity value of 16-20 years, have a low fair-market value of \$0 and a high fair-market value of \$49M. The Biomass Innovation Park assets (land, buildings, equipment), with 25 years' expected life/maturity, has a low fair-market value of \$7M and a high fair-market value of \$10M. Additional UT Renewable Energy IP licensing fees, with 25 years' expected life/maturity date, have a low fair-market value of \$0 and a high fair-market value of \$25M. These sources account for a total value of \$74M low fair-market value and a \$239M high fair-market value to the University for the \$70.5M state investment.

The fourth objective of the UTBI is building a commercial industry. Genera Energy's partner DDCE, one of the country's leading developers of integrated processing technology for cellulosic ethanol, has publicly committed to building a commercial-scale switchgrass ethanol facility in the state of Tennessee. Genera and UT are aggressively working with DDCE to develop these plans. The Tennessee Biomass Supply Cooperative, Dr. Tiller said, has been established as a model value-added processing cooperative to support commercial-scale-up of biomass supplies in a business model that benefits local landowners and rural communities. Mr. Talbot asked Dr. Tiller if, bottom-line, this endeavor will make money. Dr. Tiller said yes, it can. Cellulosic ethanol alone today--getting biomass and what it costs to get it to the plants, convert it to ethanol and sell it-- can be competitive with oil about \$80-85/barrel at commercial scale. Mr. Talbot asked about the DDCE commercial-scale ethanol facility possibility and Dr. Tiller also indicated she believes this plant will be built in Tennessee. Dr. Tiller said she expected there to be some public announcements about other DDCE facilities and investments in the near future and these will be the pre-cursor to the Tennessee facility. Mr. Horne asked about the UT percentage of such an undertaking. Dr. Tiller noted the complex formula that provides incentives for DDCE to build-out a commercial industry in Tennessee, but said there is potential for revenue stream back to UT that is included in the \$49M she had discussed earlier in the direct benefits for the success of DDCE in commercial licenses of its technology.

Dr. Tiller noted the importance of the opportunity to utilize the Biomass Innovation Park as a template to develop the Regional Aggregation and Processing Cooperatives (RAPC) that aggregate the material from a few farms within a 10-20 mile region, perform the pre-processing and move this dense material cost-effectively to the biorefinery. RAPC is a natural fit for a value-added farmer processing cooperative for supplying, aggregating, storing, processing and marketing the biomass. There are significant potential economic opportunities for Tennessee as this industry grows and matures. Today the assets are in the Vonore pilot plant with \$55M and 40 jobs, the Biomass Innovation Park of \$10M with 10 jobs, and the switchgrass production of 60 farmers/6,000 acres/\$2.6M annual. When looking to 2013, the first commercial plant in the state is expected to be in place and discussions are now taking place regarding this project, including location. The creation of this facility will bring great value to the state, including a \$425M one-time investment in construction and equipment, \$52M in annual switchgrass farm revenue, and \$102M in annual ethanol sales. In addition, over 700 annual total direct jobs are anticipated for this industry, with 51M gallons of ethanol production, using 79,000 acres of switchgrass. This begins a mushroom process with 2016 expectations of \$1.03B in capital investment for this industry within the state, \$135M annual switchgrass farm revenue, and \$300M in annual ethanol sales, with 1,464 annual total direct jobs, 151M gallons of ethanol production and 184,000 switchgrass acres.

Mr. Stansberry asked if the switchgrass revenue could be compared to another crop, possibly what the proceeds of tobacco or cattle would be, to give an idea about the switchgrass industry. Dr. Tiller noted that in the late 1980s and 1990s, tobacco gross revenue was at its height of about \$200M annually. Today it is about \$45-50M annually. By 2016, the biofuels industry could dwarf the heyday of the tobacco industry. In addition, biofuels is much more environmentally friendly to grow, is less labor intensive and has lower input costs. By 2022, Dr. Tiller said, she believes the state will have at least ten commercial-scale biorefineries in the state. With the infrastructure around these facilities, projections of \$5.7B in capital investment, \$775M in annual switchgrass farm revenue coming back into the agriculture sector, and \$1.9B in annual ethanol sales, with more than 6,061 annual total direct jobs, 951M gallons ethanol production and 784,000 acres in switchgrass production are anticipated.

The opportunity in Tennessee is huge, Dr. Tiller concluded. She emphasized that the opportunity is not just with the state's biorefineries. Other industries will locate in the state because of the biorefineries such as the carbon fiber processing and the hydrogen/chemical processing industries. Additional revenue will be generated with these industries to greatly increase Tennessee's economic development growth.

Mr. Stansberry thanked Dr. Tiller for her presentation.

VIII. Information Technology Update

Mr. Stansberry noted the short time remaining for the meeting and said that Mr. Scott Studham, UT and UTK's Chief Information Officer, would give a brief update on Information Technology.

Mr. Studham said that for the first time at UT a statewide electronic system, the new Student Information System "Banner," is in place allowing the tracking of students from matriculation to graduation. This system is integrated with a multitude of student services such as registration, academic links, course schedules and Vol Card accounts. The system could be used to offer insight to possible "bottleneck" factors hindering students getting through the system as quickly as possible in registering for classes or it could be used to point where the University needs to apply more resources. These issues could now be addressed consistently across the state with Banner. This is a multi-year project. UT Martin is the front-runner in the process and has been involved in this system since 1998; UTHSC and UTC began in spring 2010, and UTK came aboard in September 2010. All UT campuses are

now live and operational with Banner. This has been a decade's-plus \$10M project and it is a huge win for the University. Mr. Studham presented a demonstration of the "Welcome to MyUTK" web resource. Various UTK administrators were featured in interviews about the system and the applications to their office or department. UTK Registrar Monique Anderson stated that the system enforces pre-requisite checking for students as they enroll for particular courses. They now cannot enroll in a course in which they do not have the proper background or the proper pre-requisite courses completed with a passing grade. This element helps departments across the campus significantly as many departments previously had to check the pre-requisites by hand. This was time-consuming and often ineligible students were taking up slots in courses for which other students were eligible but had not been able to register for the courses. Because of the pre-requisite check feature, Associate Dean Anderson stated, students will progress to degrees in a more efficient and effective way.

One of the highlights of Banner that the old system did not accommodate, Mr. Studham noted and demonstrated, is to allow students to type in questions for information such as, "Show me all the classes on Tuesdays and Thursdays in General Education, Art & Humanities." Students are able to find information quickly instead of going on individual timetables that meet certain criteria. This feature, complemented by the electronic check of pre-requisites and co-requisites, will have a positive impact on graduation rates, Mr. Studham stated.

Mr. Studham provided an update on TERA/PAMS (Tennessee Electronic Research Administration/Proposal & Award Management System), the new research information system. This system is live and operational at UT Knoxville. It will be going live and operational on the other campuses over the next year. UT's partner in terms of this project is the University of North Carolina-Chapel Hill. Mr. Andy Johns at UNC made a presentation on this topic to members at the 2010 Winter Board Meeting at UT Martin. Mr. Studham demonstrated the application of TERA and the efficiencies and transparencies it brings to UT's research enterprise. In the past when a researcher, for example, wanted to make a proposal to NSF and there were five principal investigators (PIs) on the proposal team, each collaborative department head would need to manually sign off on the proposal and then the paperwork was literally walked around campus for other required actions and approvals at the Office of Research and other areas of submission. These steps are now handled electronically, which enables better tracking, information access and speed. TERA is a state-wide initiative and has strong campus leadership. Chancellors and Research Offices have been highly supportive and Mr. Studham thanked them for their support. Mr. Cates asked if the prototype of TERA began at UNC and Mr. Studham replied that it had.

Mr. Studham presented a video of an interview with Dr. Wes Hines, Interim Vice Chancellor of Research at UTK, who noted that--in his experience as a UT faculty member, an associate dean in the UTK College of Engineering, and currently in his present position--the PAMS reporting function will make research efforts on campus transparent. All UT personnel will have access to the proposal and award information of their colleagues in different departments. This should increase interdisciplinary research collaborations across the campus. Right on their desk tops, faculty members can have access to not only their own awards throughout their history at UT but also that of their colleagues. Prior to PAMS this information was not particularly readily available. In the old COEUS system, Dr. Hines noted, required paperwork had to be routed among all the senior PIs, department heads, and the deans of the colleges. Because faculty members were putting their time into a proposal, they needed permission from these officials who had to sign the circulating paperwork giving these approvals. In the TERA/PAMS system, this sign-off is done electronically. A department head or dean will get an email notifying them that they need to go online and approve the paperwork. The documents are then transferred to the Office of Research. There is no more hand-carrying of documents around campus, which saves hours-to-days of time on every proposal that is processed. Mr. Studham demonstrated the electronic process which now takes place in the TERA/PAMS proposal system. He

showed a graphic giving statistics readily available at any given point in time in the “proposal administration” process, indicating the number of proposals currently being submitted to the Office of Research, the number of proposals being edited by PIs, the number that had been submitted to department heads for approval, the number in the Office of Research for review, the number of proposals that has been fully executed and has actually gone out to the proposal agency, and other such vital and useful information. After proposals have gone out and decisions have been made by the award agencies, information comes back to the system within “award administration” to notify officials here about the awards that have been funded or those which were not awarded. All of this information can be seen in detail by a faculty or staff member by clicking on the appropriate link. With a single button, for instance, graphs are accessed showing which departments have brought in awards, the amounts awarded and other such information.

Mr. Studham noted that data is now being put into the TERA (research) and Banner (student services) information systems demonstrated above. UT has long had a strong financial information data base system in place. The next step in moving the information process along at UT will be to bring the three information data base systems together for complete one-stop information access, building consistency in an integrated and efficient mechanism. This will allow people to see, for example, how research is impacting the student body, teaching, finances and other important areas on campus. This mechanism has been designed with cost savings in mind. Mr. Studham showed a graph indicating diminishing central IT costs over the last few years of approximately 10 percent despite budget constraints and rising enrollments in the UT system. This is a big achievement, Mr. Studham said, and he gives the Chief Business Officers, Chief Information Officers and their staffs all the credit for this accomplishment. Communication is greatly improved among the campuses in making sure operations are being done effectively and efficiently together. Major IT projects such as research and student information systems have long been undertaken at UT; however, there is a much greater collaborative process in driving these initiatives among the different campuses.

Mr. Wharton asked Mr. Studham if a previously mentioned \$20M savings in IT costs, approximately five years from the present time, might be a realistic assumption. Mr. Studham stated this savings would not be realistic. He noted on the graph where central IT costs were at the present time had been reduced by 12 percent over the last two years (now at ~\$50M) and said this is a comfortable, stable level for IT. When initial numbers for the total cost of IT had been reviewed, a very rough estimate for the total cost of IT (\$90M rather than \$50M) had been made by people in the IT field. In FY 2008 central IT costs were just over \$56M and are now at \$50M. Mr. Studham stated he does not believe central IT costs will likely go much lower than they are at the present time. Mr. Wharton asked if efforts were being made to eliminate boot-leg and duplicative systems occurring at UT. This has been done to some degree, Mr. Studham stated, but these systems are always popping up and “championship” of eliminating this activity cannot be claimed. IT staff are working hard to handle these occurrences.

Dr. Johnson asked when the TERA/PAMS systems are envisioned to go live at Memphis, Martin and Chattanooga. This will take place over the next year, Mr. Studham responded. The development and test environments are already up now. Work is taking place with research officers now to start logging in and validating the system.

Mr. Wharton asked if a look is taken at IT costs on the basis of certain benchmarks, on a per-student served or per-faculty member served basis, what UT costs would be in comparison to other universities. Mr. Studham stated that at the present time UT is most comfortable with these comparisons and he is pleased with the IT numbers and believes they are where they should be.

Dr. Gourley asked about interaction among campuses of the TERA/PAMS systems. He asked specifically if the program provides numerical information about the number of grants submitted, along with the dollar value, and the grants then funded within a certain academic year, the annual total for each grant and the annual expenditures for each grant. Mr. Studham stated that once information is imputed into the system and is flowing through the system, an individual will be able to log into the system and obtain this information.

Mr. Stansberry asked Mr. Studham to stay after the meeting or to be available during lunch to address any additional IT questions. Mr. Stansberry apologized for cutting short Mr. Studham's presentation but noted the adjournment time was at hand and other Committee meetings were to follow.

IX. Other Business

There was no new business.

X. Adjournment

Mr. Stansberry thanked members for their participation in the meeting. The meeting adjourned at 10:35 a.m.

Respectfully submitted,

David E. Millhorn, Ph.D.
Executive Vice President