Minutes of the Research, Outreach and Economic Development Committee

The University of Tennessee
Board of Trustees

June 23, 2010
Knoxville, Tennessee

The Research, Outreach and Economic Development Committee of the Board of Trustees of the University of Tennessee met June 23, 2010, in Room 160 of the Plant Biotech Building on the UT Agriculture campus in Knoxville.

I. Call to Order

Mr. Don Stansberry, Chair, called the meeting to order at 3 p.m. Mr. Stansberry noted that although the Committee meeting was being held in a public format it was not a public meeting. This format recognizes members of the Committee, Trustees, members of UT's senior staff and invited speakers to make presentations on the Committee's agenda. No other business will be conducted other than items listed on the previously distributed materials. 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

Commissioner Ken Givens, Dr. Richard Rhoda, Mr. Glenn Turner, and Commissioner Tim Webb were absent from the meeting.

Dr. Millhorn declared a quorum present for the meeting.

III. Approval of Minutes of the Last Meeting

Mr. Stansberry asked for any amendments or corrections to the minutes of the February 25, 2010 meeting in Martin. There were none. Mr. Stansberry asked for a motion to approve the minutes. Mr. Gallimore moved the minutes be approved and Ms. Tanner seconded the motion. No discussion took place. Mr. Stansberry announced the motion carried.

IV. Research Highlights

Mr. Stansberry recognized Dr. Millhorn to present highlights of the UT research program.

Dr. Millhorn showed a power-point slide of the new logo for Cherokee Farm. (The logo, graphics and other information can be seen on the Cherokee Farm website: http://www.tennessee.edu/system/cherokee.) Dr. Millhorn noted that construction has begun on the site and EMJ Construction in Chattanooga is the prime contractor for the infrastructure (roads and utilities) projects. Over the next 12-18 months this work will transform the site. The first building, for the Joint Institute of Advanced Materials (JIAM), will be bid in the fall of this year. A more detailed report on Cherokee Farm will be given at the next ROED Committee meeting.

Dr. Millhorn noted that Dr. Stacey Patterson would be making reports later in the meeting concerning UT's solar energy and the EPSCoR programs. Dr. Millhorn stated that he made a presentation in May to the UT Effectiveness and Efficiency for the Future Committee concerning the status of Information Technology (IT). Efforts are continuing to reduce the IT budget. In a recent meeting with CIO Scott Studham, Dr. Millhorn was told that within the last 18 months the central budget has been reduced by over $5M and that enhanced collaborations between campus IT units and the central IT office are taking place. Further budget reductions are expected. A more detailed IT presentation will be made after budgets have been set this fall.

The biofuels program, Dr. Millhorn stated, continues to make good progress. Within the next 2-3 weeks UT cars will be filled with UT ethanol at the Motor Pool. Jeff Smith (Deputy for Operations, Oak Ridge National Laboratory) has told Dr. Millhorn that ORNL is also filling ORNL vehicles with UT fuel.

Dr. Millhorn stated he would use the remainder of his presentation timeframe to discuss a new endeavor the University, through UT's bioenergy company Genera Energy LLC, was recently contacted to undertake by the U.S. Department of Defense (DOD) regarding potential biofuels production and related opportunities in Afghanistan. A major challenge for the Pentagon, as reported by *The Washington Post,* is getting

aviation and diesel fuel to U.S. troops in Afghanistan in an economically efficient and secure fashion. DOD requested UT and Genera officials travel to Afghanistan to look at the problem of getting biofuels to U.S. air and ground troops. Afghanistan is a land-locked country and all fuels and supplies must come in through Pakistan or one of the old Soviet Republic nations, creating great risk of ambushes and insurgent attacks. Approximately 70 percent of U.S. troop casualties in Afghanistan are convoy-related. Dr. Millhorn and Mr. Louis Buck (Genera Energy feedstock commercialization manager) traveled to Afghanistan the first week in May and spent over a week in meetings and site visits with DOD and military officials to look at these issues, particularly in light of President Obama's plan to increase the number of U.S. troops in Afghanistan. The Pentagon pays an average of $400 to put a gallon of fuel into a combat vehicle or aircraft in Afghanistan. This is full-burden cost from port to vehicle or generator. Dr. Millhorn showed a graph based on 2000-2009 data indicating the direct correlation of U.S. troop casualties/wounded and fuel consumption in Afghanistan. The graph also projected these numbers to the year 2014, showing that both the number of casualties and amounts of fuel consumed will likely double the current statistics. It is critical to solve the problem of the need to transport fuel from outside Afghanistan under hostile conditions. Dr. Millhorn and Mr. Buck were asked by DOD to work with the Marine Corps in Helmand Province, in the southern part of Afghanistan bordering Pakistan and located not far from the Iranian border, to help solve the fuel problem for locally-sourced alternative biofuels for electric generators. A related need is to help alleviate the poverty and opium problems in this area by creating an alternative economic base to poppy-production. Forty percent of the population's income comes from poppy production and 79 percent of Afghans have no electricity.

Dr. Millhorn noted that that the DOD Task Force consisted of officials from the Afghanistan Ministry of Agriculture, Irrigation and Livestock; the U.S. Marine Corps; members of the Task Force for Business and Stability Operations; a Provincial Reconstruction Team; Texas A&M; and the University of Tennessee and Genera Energy. Headquarters for the Task Force in Helmand Province was Camp Leatherneck, a U.S. Marine Corps base which quarters over 10,000 personnel and manages supplies-forward operations. It is located in mostly desert country with extremely hot temperatures (120 degrees when Dr. Millhorn and Mr. Buck were there). Dr. Millhorn showed graphics of the large number of generators needed to supply electrical needs to maintain the base.

Most of the traveling done by Dr. Millhorn, Mr. Buck and other Task Force members was in V-22 Osprey helicopters and the Marines secured their safety throughout the trip. On one occasion the Osprey sensors picked up hostile activity. Ground travel is extremely dangerous. Body armor must be worn at all times. Using these modes of transportation the Task Force was able to obtain a panoramic view of Helmand Province to assess the issues under review. In one slide Dr. Millhorn pointed out a river held in place by the Kajaki Dam which was constructed by the Tennessee Valley Authority in 1950-60's era. The surrounding area is green and fertile. The lack of water and irrigation in Afghanistan

is a huge problem. More water access would allow greater agricultural production which is sorely needed by the country.

Dr. Millhorn showed slides of hand-dug wells called karezes. The vast majority of Helmand Province is sustained by groundwater brought to the surface by hundreds of these karez systems. Karez structures are often several thousand feet long with numerous vertical shafts, similar to U.S. storm sewers with manholes but without piping, support or modern equipment of any kind. With these systems, wheat and other crops can be grown. Currently the main crop is poppy. Poppies are grown by over 40 percent of the population and, significantly, 40 percent of the population is drug-addicted to opium. Electricity is available in only 21 percent of Afghanistan homes and it is only available intermittently during the day. UT and Genera have been identified to help introduce new technologies to help with these issues.

Dr. Millhorn showed slides of homes and villages in Helmand Province, most of which have been bombarded for years, first by the Russians and then by other insurgents. Despite crude living conditions, roof-top satellites were noted on numerous structures and solar panels were shown tossed in yards used to generate energy to charge cell phones and other small devices. Black-market fuel is also used to run small generators. The contrast of the crude living conditions with the use of the occasional modern device was striking.

After visiting the area for 8-9 days, the Task Force met with Marine Corps officials to develop a strategic plan to address the critical issues involved in improving fuel production-transport and the economic development situation in general. First and foremost, the success of this plan will directly affect the number of future casualties U.S. troops will sustain. The Afghan Bioenergy Feasibility Study plan consists of three segments: 1) a strategic plan to build and demonstrate modular biodiesel conversion capability for military cooking grease waste and locally-grown oilseed crops and extruded vegetable oils, 2) a strategic plan to build and demonstrate modular biomass gasification conversion capability to generate electricity from existing biomass and then growing a purpose-grown biomass, and 3) to assess the long-term potential of selected biomass species to benefit from intercropping/bio-irrigation (roots-source groundwater) strategies toward productive biomass from non-irrigated lands. More focus is being placed on the first two strategic plan segments as they are viewed as more likely to succeed.

Dr. Millhorn commended the Marine Corps leaders, other military officials and U.S. troops serving in Afghanistan and noted they are doing their jobs in an extremely professional and capable manner given the situations at hand. Dr. Millhorn and Mr. Buck received the utmost cooperation and protection during their visit. While in Afghanistan there were three long meetings with the commanding general--a very rare occurrence--due to the importance placed on the work of the Task Force. Since Dr.

Millhorn and Mr. Buck's return to Tennessee there have been several email exchanges from Marine leadership concerning the status and aspects of the project.

Dr. Millhorn showed a final slide of "the faces and future of Afghanistan"—the Afghan children. These children are far from immune to the hostile conditions of the country.

Dr. Millhorn noted the high honor of being identified and then selected to help with issues affecting the U.S. presence in and for the Afghanistan country itself. A final report to DOD is currently being prepared and should be finalized within the next few weeks. Dr. Millhorn stated that one of the reasons he wanted to see the conditions in Afghanistan for himself was to make sure safety of UT and Genera employees could be maintained on-site in Afghanistan. He believes work within the military bases themselves can be secured for this purpose.

Mr. Stansberry asked for an overview of the DOD project operation within the University and what benefits the project would bring to the University. Dr. Millhorn noted the initiative initially would be a small-scale business endeavor for UT although it will bring in DOD funds. The project budget could certainly grow and become a much larger business opportunity for the University. Primarily in its early stages it will likely provide intellectual property opportunities and will be seen chiefly as a demonstration project providing economic development opportunities for Afghanistan. As the Taliban is moved out of the country, it is imperative to move opportunities into the country to maintain the economy. Foremost this initiative will be a project to support our government in helping to save lives and to improve conditions in Afghanistan. Mr. Stansberry commented on the modular solar panels shown in the slides and Dr. Millhorn noted that the Task Force had discussed solar energy usage quite often during the trip. The Marines will be testing use of more modular solar panels, many coming from the Pulaski, TN plants. Security and investment costs will be key factors in use of large solar farms in Afghanistan. Mrs. Tanner asked about the timeframe of the project. Dr. Millhorn indicated to the Marines that if a decision is made to pursue biodiesel technologies, these technologies are now available. The business end of this pursuit will require more work.

Mr. Stansberry commended Dr. Millhorn for his leadership in the University's identification and selection by DOD for collaboration on the project. This selection, he noted, brought distinction to the University and there is also potential for beneficial future opportunities for the University.

ORNL Update

Dr. Millhorn introduced Mr. Jeff Smith, Deputy of Operations at Oak Ridge National Laboratory (ORNL), and noted that the UT-Battelle management contract with DOE was recently extended for an additional five years. Dr. Millhorn noted that Mr. Smith must receive a large part of the credit for the extension and that Mr. Smith heads the list of

successful lab operations leaders throughout the country. Dr. Millhorn has asked Mr. Smith to give an overview of what, in Mr. Smith's perspective, has occurred at ORNL during the ten years' UT-Battelle management and operations of ORNL.

Mr. Smith noted that, in his long-term professional career with Battelle Memorial Institute (which manages or co-manages six DOE national laboratories: ORNL (with UT), Brookhaven (with SUNY-Stony Brook), Idaho, Lawrence Livermore (with UC and Bechtel), NREL (with MRI), and Pacific Northwest, he believes UT-Battelle management of ORNL is the best DOE laboratory management partnership team in the nation. Mr. Smith provided power-point slides illustrating the backgrounds of the University of Tennessee and Battelle Memorial Institute and their respective strengths in partnering in ORNL management: UT: an ORNL partner since 1946, state-funded Science Alliance started in 1982 to build programs with ORNL, shared research and joint appointments, joint institutes in advanced materials, biological sciences, computational sciences, neutron sciences and nuclear physics; Battelle Memorial Institute: a 65-year relationship with DOE, develops and deploys technology worldwide, and manages or co-manages six DOE national laboratories. Mr. Smith noted that when UT-Battelle began as ORNL management partners in April 2000, the vast portion of the ORNL campus was one huge parking lot. At that time the Lab was in decline and DOE was in the process of dividing the management contract at Oak Ridge Reservation by separating management responsibilities for the facilities into cleanup, weapons and research. In addition, the Spallation Neutron Source (SNS) project was in jeopardy. The community was looking for more engagement from the Lab, and the relationship between local contractor management and DOE-Oak Ridge Operations was strained. The DOE funding for ORNL management at this time was approximately $500,000 per year.

The UT-Battelle proposal for ORNL management submitted in 1999, Mr. Smith noted, had two slides depicting plans for modernizing the Lab and improving the infrastructure. UT-Battelle made the commitment with its visionary leadership at the time to obtain bipartisan state support to help effect these improvements and to foster weight for a successful proposal to DOE. A part of the UT-Battelle proposal strategy was to partner with the State of Tennessee to enhance ORNL capabilities through construction of four new buildings: the facilities to house the Joint Institute for Neutron Sciences ($8M), Joint Institute for Biological Sciences ($8M), the Oak Ridge Center for Advanced Studies (ORCAS, $4M), and the Joint Institute for Computational Sciences ($6M). This type of state support was critical to the proposal success. Mr. Smith noted that such strategic support has now been received by two state administrations. Mr. Smith showed a slide outlining substantial progress and corresponding investments by DOE, the private sector and the state in updating ORNL's research campus. This kind of collaboration in 1999 was unique to the DOE national laboratory management system and has been instrumental in transforming the Laboratory over the last ten years.

Mr. Smith noted the remarkable physical transformation that ORNL has undergone during UT-Battelle management. He presented slides showing four segments of the

ORNL campus--East, Chestnut Ridge (which houses the SNS facility), West (housing environmental and biological work sites), and the Central Campus' Science and Technology Park--and noted the primary operations taking place within each segment. There is now a vibrant campus environment at ORNL. When UT-Battelle began managing ORNL in 2000, employee recruitment was virtually stopped in some areas as it was decided ORNL was doing itself more harm than good in trying to attract new talent to the Lab when infrastructure conditions were at such low levels. Significant improvements were made to create the positive campus environment now found at ORNL. New conference rooms and meeting places, courtyards, a credit union, new signage, laboratories, a new cafeteria, fitness center, auditoriums, coffee bars and more are now available to ORNL employees and visitors. Some of this modern infrastructure transformation was accomplished through reinvestment of the fees UT and Battelle earn as Lab management partners, as DOE prohibits using its direct revenues for such improvements. This kind of commitment by UT-Battelle has been critical in modernizing ORNL and in creating the strong partnership that has successfully earned DOE extension for ORNL management.

The UT-ORNL Joint Institutes have been essential to the ORNL transformation, Mr. Smith noted. The five Joint Institute (JI) programs have followed the model based on the first JI, the Joint Institute for Heavy Ion Research initiated in 1982. There have now been four additional JIs, three of which have been completed: Joint Institute for Computational Sciences (JICS), Joint Institute for Biological Sciences (JIBS), and the Joint Institute for Neutron Sciences (JINS). The Joint Institute for Advanced Materials (JIAM) was initiated in 2007 and the $30M facility will be constructed at the Cherokee Farm campus. The JIs have been instrumental to the work being done at ORNL and UT and the shared programs today exceed $200M. Mr. Smith briefly outlined highlights for each JI. He noted that two acres at ORNL are now devoted to JICS' operations. Dr. Thomas Zacharia and other ORNL and UT leaders made a commitment in 2001 for JICS and, along with essential private-sector and state funds, the $10M facility was completed in 2006. In 2008 the National Science Foundation (NSF) awarded a $65M grant to UT and ORNL to establish the National Institute for Computational Sciences. In 2009 JICS became the home to Kraken, now the world's most powerful academic computing system and the first academic supercomputer to reach the petascale. In 2009 Kraken was rated #3 on the Top 500 list of the world's most powerful systems. Currently there are over 420 active partnerships involved with the use of Kraken. It is easily the best example of the success of the ORNL and UT commitments to improve ORNL infrastructure.

The JIBS $11.8M facility was initiated in 2006, ahead of the original schedule to take advantage of a Department of Energy (DOE) competition for a large biological sciences research center. The proposal leveraged $70.5M in state investments in the Tennessee Biofuels Initiative. In 2007 ORNL was selected to lead one of three DOE Bioenergy Research Centers. Today JIBS is the anchor facility for the multi-institutional BioEnergy Science Center (BESC), with funding at $135M over five years. Much intellectual

property activity (22 invention disclosures at present) is anticipated and is currently underway, including significant biofuels and bioproducts breakthroughs involving the conversion of cellulosic materials into ethanol.

The Joint Institute for Neutron Sciences (JINS) is now coming to fruition with construction of an $8M facility just completed. JINS was begun through a Memorandum of Understanding between ORNL and UT in 1998, and in 2001 JINS was launched as a virtual center for outreach and education programs to enhance and support research at the Spallation Neutron Source (SNS) and the High-Flux Isotope Reactor (HFIR). JINS is the intellectual hub for the neutron science community and serves as home-base for an extensive visitor program for new research collaborations.

The programs outlined above, crucially supported by state funds Mr. Smith noted, have made a remarkable impact on ORNL and UT operations. The assumption of risks has paid off in new capabilities and opportunities. The ORNL annual budget is now at $1.4B. It is estimated that approximately $100M of research work is now at UT as a result of the above-described investments and collaborations. In all total, an approximate $200M swing has occurred in the level of activities taking place now and what was taking place ten years ago when UT-Battelle began its partnership in the management of ORNL. There is more work to do, however. Mr. Smith showed a slide which highlighted the significant number of current and pending improvement projects spanning all segments of Lab activities. Mr. Smith noted, in particular, plans to construct a new maintenance facility at the Melton Valley area and the construction of a guest house to be built within the JINS operations' Chestnut Ridge area of the ORNL campus. Mr. Smith presented slides showing the West Campus construction of new greenhouses, a research support facility and a new carbon fiber test facility made possible by a successful DOE proposal. There are over 30 companies now working with ORNL on the subject of carbon fiber.

Mr. Smith noted that a clean-up effort on approximately 30 acres within the Central Campus' Science & Technology Park is taking place to facilitate private industry and Lab collaborations, similar to the approach of the Cherokee Farm Campus. The first facility, constructed by the private sector, is now occupied by Pro2Serv. Once demolition of several old buildings occurs, there will be 500,000 square feet of space available for the private sector at ORNL. On the East Campus plans are underway for a new parking facility, a Chemical and Materials Science building has been constructed, and new facilities for a microscopy lab and expansion of the Computing Sciences Building (housing the supercomputers) are slated for construction.

As Dr. Millhorn had previously indicated, Mr. Smith noted, the UT-Battelle ORNL management contract was recently extended for five years. This is a clear indication of the strength of UT-Battelle contract performance. UT-Battelle leadership has been working on this outcome for the last ten years in delivering nearly all that was promised for the ORNL management: leadership in the critical areas of science and technology,

state-of-the-art facilities in a vibrant campus setting, safe and compliant operations, strategic investments in the Lab's future, and recognition as a regional resource for economic development and community service. Mr. Smith noted that DOE is using ORNL operations and management as a model for its other national laboratories.

UT Trustee Jim Murphy asked Mr. Smith how much area on the West Campus remains for older buildings to be demolished and then for redevelopment. Mr. Smith replied that there is an approximate four city-block area (20 acres) in the core of the West Campus, comprised of the Old Manhattan Project area, targeted for redevelopment. The clean-up cost is estimated to be $2B. ORNL has been working for the last five years to move this core area into an initial group of targeted clean-up areas and the current state administration is backing this arrangement. ARRA funding will be used towards the clean-up and redevelopment costs, with an approximate 20-30 years' timeline.

Mr. Talbot asked Mr. Smith if he could provide any ideas for the development of the Cherokee Farm project. Mr. Smith noted he serves on the advisory committee for Cherokee Farm and he is working with Dr. Millhorn and others in this regard. A discussion took place concerning ORNL's impact in helping to attract large private companies to the Cherokee Farm project and to Tennessee. Mr. Smith noted that the proximity to large research capabilities is a strong attraction for many industries. Dr. Millhorn noted that UT and ORNL were instrumental in the success in attracting Volkswagen to Chattanooga. Mr. Smith noted that the carbon fiber market and industry is the next major push for such initiatives. ORNL has the largest carbon fiber capability in the world. Mr. Gallimore inquired about applications for carbon fiber. Mr. Smith noted that this industry is expanding rapidly, particularly with the automotive industry. Mr. Stansberry asked how this science might impact the future Joint Institute for Advanced Materials operations at Cherokee Farm. Mr. Smith referred this topic to others more closely associated with the facility but indicated that he believed there would be opportunities for such initiatives and especially in regard of the solar institute operations to be positioned at the Cherokee Farm site.

Ms. Moore suggested that a visit be made to the ORNL campus, especially since a visit has not been made since receipt of the NSF UTK supercomputer located at ORNL. She and others would like to take a first-hand look at many of the programs and operations highlighted by Mr. Smith. Mr. Smith said the UT Trustee group is welcome any time they would like to visit ORNL and Dr. Millhorn and he will be pleased to make the visit arrangements. Any individual visits are also welcome.

Mr. Stansberry thanked Mr. Smith for the excellent report he presented and for the good work he is doing at ORNL. Mr. Smith received a round of applause from members.

V. Annual Report of UT Research Foundation

Dr. Randy Gentry, President and CEO of the University of Tennessee Research Foundation (UTRF), presented an update of activities over the past six months and outlined a vision of how the UTRF is evolving with respect to intellectual property and public-private partnerships. Dr. Gentry gave highlights of UTRF's work at the different UT campuses including the Tennessee Solar Institute and Solar Farm, Genera Energy, TNInvestco, Vol Court and Entrepreneurship Bootcamp, and Tnovation.

In the past, Dr. Gentry stated, UTRF primarily focused on pure technology transfer and as such operated as a shop that took disclosures from UT's campuses, assessed them and then chose what to move forward with in terms of licensing and partnerships. The business side of these public-private partnerships is now being reviewed more vigorously to generate stronger economic development and self-sustaining results and then aggressively moving these partnerships to a more rapid commercialization framework. The Tennessee Solar Institute and Solar Farm initiatives are examples of the large-scale economic development enterprises being viewed as models to better study and implement strong public-private partnerships. The UTRF goal is to increase its bottom line of revenue generation for itself and for the enterprises under the UTRF umbrella.

Dr. Gentry noted Dr. Stacey Patterson would provide greater detail during her subsequent presentation on both the Tennessee Solar Institute (TSI) and the Solar Farm initiatives. He briefly outlined, however, the $62.5M ARRA funded projects that came to Tennessee from the Department of Energy grant to the Department of Economic and Community Development (ECD). Of these funds, $2.3M stays with ECD and $60.2M comes to UT. The key projects in the UT-ECD partnership are the Tennessee Solar Institute (which will be managed by UT and ORNL and is a $29.2M grant) and the West Tennessee Solar Farm near Brownsville (a $31M grant). Of the $60.2M, $58M will flow into UTRF. These solar project activities are designed to leverage the existing solar value chain in Tennessee, to support recent solar recruits, and to attract new solar investments. Dr. Gentry showed graphic conceptionalizations of what the 5MW solar array Solar Farm will look like. UTRF can serve as a strong vehicle for such large-scale economic development projects and Dr. Gentry said this is the kind of activity UTRF should be working on with the University and with the State in looking for grant opportunities.

Dr. Gentry provided graphics of the Genera Energy biofuels plant facility in Vonore and briefly discussed the TNInvestco, Vol Court and TNovation programs. He noted the TNInvestco program is a state initiative whereby $120M of future tax credits were made available to insurance companies that had a net present value worth of at least $84M which could be used now for capital investments for early-stage company development. UTRF is a principal in one of these funds: TN Community Ventures. Dr. John Hopkins (Vice President of the UTRF Multidisciplinary Office in Knoxville) is a participating

partner of TN Community Ventures and he believes it will bring approximately $1.5M to UT for the purpose of investment and moving technologies further into commercialization. UTRF is actively providing training and informational workshops on UT's campuses for faculty and staff. There is great interest for entrepreneurial partnerships and UTRF works to move these ideas into private business. Dr. Gentry addressed Vol Court and TNovation as two such initiatives.

Dr. Gentry presented performance metrics graphs showing activities within UTRF over the past year. The disclosures metric revealed a generally upward trend with a total of 87 disclosures (56 through the Multidisciplinary Office (MDO), 31 at the Health Science Center Office (HSC). UTRF is showing a growth in the number of its disclosures, whereby a faculty member or entrepreneur has an idea, has done some preliminary data assessment and then discloses the intellectual property to UTRF and UTRF attempts to pursue a patent or license on the property. If UTRF is thought of as an "engine," disclosures are the "fuel" for the engine. Trustee Jim Hall inquired about the non-UT disclosures (3) reported during the last year. Dr. Gentry noted that anyone from the general public may bring a disclosure to UTRF and UTRF will assist if the idea seems successful for commercialization.

New staff has been brought in to enhance growing the UTRF. A new licensing agent in Memphis will begin within the next week or two, and a licensing associate, Dr. Sharon Ngwenya, and a business manager, Ms. Samantha Jeffers, have been hired at the MDO in Knoxville. In the licenses metric, Dr. Gentry noted that UTRF generally manages around 15 licenses a year and in FY10 thus far there are 13 licenses (4 MDO, 9 HSC). The revenues from the licenses (royalties and external reimbursements) currently are at $800K for MDO and $507K for HSC. Regarding patent applications for FY10 YTD there are currently 23 patent applications out of MDO (with 5 international patents) and 18 patent applications from HSC. The number of patent applications is going down, but this is in large part due to determined UTRF strategy to be more selective in pursuit of patent applications in order to make the best possible investments. In some cases it may be the best strategy is not to pursue a patent but to take another direction for a particular technology.

Dr. Joe DiPietro, Chancellor of Agriculture, asked what UTRF aspirations are for the next five years. Dr. Gentry noted he plans to visit each UT campus and go through a strategic planning process in which five-year goals will be identified. Today's presentation is basically a baseline against which future growth will be assessed. With campus cultures of increased incentives to award hardworking faculty and researchers, a 50 percent growth rate within the next five years is not unrealistic. Dr. DiPietro asked what the procedure would be if UTRF determined a particular technology was found not to be a good investment. Dr. Gentry noted that the technology would be returned to the inventor; however, UTRF may elect to assist the inventor in other avenues other than the pursuit of a patent should this be beneficial for both parties. UTRF is working to

improve its assessment of new technologies and the entire decision-making process in determining what technologies to pursue and in which to invest.

Mr. Stansberry asked if Dr. Gentry believed the two Executive Committees were making progress and Dr. Gentry noted that in his assessment the Committees seem to be working very well. Dean Gourley with HSC and Dr. Wayne Davis with MDO have been working diligently to find the right footing under the reorganization. Mr. Wharton inquired if the split of funding from UTRF to HSC and MDO seemed fair and equitable. Dean Gourley concurred that the funding structure seems fair and that the new format of having the first $5,000 in revenues come to the inventor is beneficial and ensures a good balance for UTRF payouts back to the campus. It is now a matter of increasing the volume. Mr. Schledwitz noted that the HSC Office has learned that money is coming back in a more-timely basis and there doesn't seem to be a bureaucratic delay in receiving these funds. Mr. Schledwitz expressed appreciation for the work and time spent by Mr. Stansberry in reorganizing UTRF into a more efficient organization. Mr. Schledwitz noted it will take time to build the new organization but things appear to be going in the right direction. Mr. Stansberry noted that Dean Gourley and Dr. Davis are doing a terrific job in their respective roles.

Dr. Jimmy Cheek, UTK Chancellor, asked Dr. Gentry where UTRF should be on a revenue stream, i.e., a royalty stream, five years from now. Dr. Gentry noted that there are a large number differing models and it is difficult to gauge such statistics. From-disclosure-to-revenue-streams can fall into an 8-10 year timeframe. If there is sufficient activity within a five-year mark, with investment in the right technologies, there can be significant revenues. Pharmacy is an area where success can happen quickly, even overnight. Operational aspects vary greatly among research corporations and foundations. Initiatives such as the Solar Institute and other large economic development type projects will give UTRF opportunities to seed-invest at a higher rate and to aggressively market these technologies to see increased revenue returns in a shorter amount of time.

Mr. Stansberry noted that UTRF needs faculty to focus in the areas where there is greater opportunity for success. An example is the Solar Institute, which will provide opportunities for testing a great range of solar technologies to determine uses and revenue streams not only for the Solar Institute and Solar Farm but for other endeavors as well, as Dr. Millhorn is doing with switchgrass and biofuels initiatives. Dr. Cheek noted that the UT-Battelle Board of Governors is also concerned with improving revenue streams by changing the organizational culture to allow increased productivity and in maximizing employee capabilities. It's a matter of investing in the right technologies and then getting a return on that investment. Dr. Gentry noted that UTRF is directing many of its efforts in aggressively communicating with and in educating faculty concerning the disclosure and intellectual property processes. UTRF is striving to have a greater visibility on the campuses in talking with faculty, department heads and college deans to increase disclosure flows. Dr. Cheek noted this has happened to some

extent but the growth goal has to be ever present in this process. Mr. Stansberry requested Dr. Cheek's help in encouraging disclosures through tenure consideration and other faculty rewards. Mr. Stansberry believes this is an important part of a Chancellor's role. Dr. DiPietro noted there is now a better framework in place to motivate faculty via a substantial return on an invention. Dean Gourley noted that a factor in stimulating interest has been the investment fund. Expanding this base will provide greater motivation for faculty and will make the process appropriately competitive.

Mr. Stansberry stated there is much work yet to be done but he believes UTRF is going in the right direction for improvement and growth. Mr. Stansberry thanked Dr. Gentry for his presentation.

VI. Presentation on Volunteer State Solar Initiative

Mr. Stansberry introduced Dr. Stacey Patterson, UT Director of Research Partnerships in the Office of the Executive Vice President, to present a report on the Volunteer State Solar Initiative. Dr. Patterson noted the initiative was first announced by Governor Bredesen during his State of the State Address last fall. The Governor stated he wanted Tennessee to be a leader in all things solar. The funding for the initiative became available in September 2009 through a Department of Energy grant to the Tennessee Department of Economic and Community Development (ECD) for the State Energy Program. The one-time American Recovery & Reinvestment Act (ARRA) funds were granted to ECD to support two separate but related projects: (1) the Tennessee Solar Institute and the Solar Opportunity Funds and (2) the design and installation of the utility-scale West Tennessee Solar Farm project near Brownsville. Both projects are designed to leverage the existing solar base in Tennessee to support recent solar recruits and to attract new solar investments in the state. The first example of the success of this program was evidenced in the announcement by Confluence Solar that the company planned to relocate in Clinton, TN, in large part due to the Volunteer State Solar Initiative and the programs offered within this initiative.

Dr. Patterson reviewed the funding flow of the initiative, as Dr. Gentry previously described, to reflect that the DOE grant moved through ECD to the UT system, with oversight by Dr. Millhorn. UTRF is a subcontractor in the initiative and will administer two grants programs (Innovation/Installation) and the design and installation of the 5MW Solar Farm in Haywood County. Within the initiative there is a public education component enabling collaboration opportunities with the UT Institute of Public Service (IPS) and in particular with the IPS Center for Industrial Services to provide technical assistance and workforce development opportunities across the state of Tennessee.

Dr. Patterson stated Governor Bredesen's vision for the Tennessee Solar Institute (TSI) has been influenced by Dr. Millhorn and Drs. Thom Mason and Thomas Zacharia from Oak Ridge National Laboratory (ORNL), and TSI is now envisioned as a Center of

Excellence between UT and ORNL to serve as a centralized hub and catalyst to bring together TSI leaders and policy-makers at the state and federal government levels. Initially the ARRA funding will support both the Solar Innovation and Installation Grant Programs with boots-on-the-ground technical assistance provided by the IPS Center for Industrial Services and their partnering networks, commercialization assistance to help this young industry to take major technologies and move them into the marketplace, and a variety of workforce development opportunities. The ultimate vision is that the TSI will become a Research Center of Excellence, where leading scientists and engineers from UT and ORNL can develop cutting-edge/next-generation solar technologies and solar materials to impact and grow solar industry in Tennessee.

The $14.5M Solar Innovation Grants Program's goal is to encourage the growth of Tennessee's solar industry by offering competitive awards to provide technical assistance, facilities and equipment improvements, renewable energy products, process improvements, technology improvements and workforce development. The Request for Proposals (RFP) for this program is expected to be released this summer and proposal applications are open to any Tennessee company which identifies itself (and TSI agrees) as being in the solar value chain or is seeking to enter the solar value chain.

The Solar Installation Grants Program is funded for $9M with the goal to speed the deployment of solar energy in Tennessee. When the program was begun there was less than 1MW of solar power on the TVA grid coming from Tennessee and by the end of this summer this number will be more than 10MW. The TSI has been fortunate in recruiting a capable staff and work is progressing rapidly. The Request for Applications (RFA) was released on June 8, 2010, and applications were accepted for this program beginning June 21. As of this date (June 23) a total of 58 applications have been received. If all 58 applications were to be approved, almost 5MW of solar power would be available to be installed on or around businesses in Tennessee. The program is open to for-profit and not-for-profit 501(3)(C) organizations and is intended to help offset high installation costs (especially for small companies) of small-scale (ground-out or roof-top) solar systems funded on a reimbursement-based model. One factor for the good RFA response is a grant workshop conducted by TSI staff in each of the nine development districts to inform the public about opportunities available within the program. More than 250 individuals participated in these workshops across the state.

Within the ARRA funding additional programs will be provided for Industry Assistance and Workforce Development to develop and manage partnerships to support commercialization. The solar industry is a relatively new industry now growing and coming into its own. UT wants TSI to be the hub where everyone in Tennessee with any solar energy interests will come and learn about the resources available through the TSI programs. A database of industry resources and contacts will be created and maintained to facilitate awareness of solar resources. Often Company A in Tennessee does not know about the existence of Company B in Tennessee and Company A is actually going out of state for resources when these services could be provided by

Company B. With a centralized hub this kind of information is available. Further, partnering retreats, meetings and seminars will be conducted across the state; on-the-ground assistance will be provided to industry; industry workforce needs assessments will be conducted to better target real needs, i.e. more installers or more Ph.D. expertise working on solar-safe materials ; workforce development training opportunities will be provided; and TSI will coordinate engineers, scientists and manufacturers in solving specific technical problems and improving cost effectiveness.

The TSI website (http://solar.tennessee.edu) provides RFA information, applications, and a variety of related information. A toll-free number is also given to contact TSI staff for additional information if needed. Dr. Patterson introduced Dr. John Sanseverino, TSI Director of Programs, and Ms. Kim Holbrook, TSI Communications Manager, who attended the ROED Committee meeting.

Dr. Patterson stated the objectives given by Governor Bredesen for the West Tennessee Solar Farm were to demonstrate a utility-scale power production project. This would be at least a 5MW facility, one of the largest in the Southeast, with fixed-mount, multicrystalline or monocrystalline photovoltaic panels. A 5MW facility will fill an approximate 20-25 acres of solar panels. Plans are to connect the Solar Farm panels to the Tennessee Valley Authority (TVA) grid through a local distributor in Haywood County. As Governor Bredesen described in his announcement, the Solar Farm is expected to grow and thus it will reinvest the revenue from its solar power sales back to itself for array expansion, improvements and education programs. TSI is working closely with the Tennessee Department of Transportation (TDOT) on Interstate Education and Welcome Center plans to be co-located with the Solar Farm. The vision for this site is for it to be a place where anyone, of any age, can come (Solar EPCOTT, Dr. Patterson says) for a hands-on learning experience to feel they are virtually a part of the Farm in learning about solar and other alternative energy programs. Potentially, the Farm can also become a future demonstration site of emerging technologies and materials as they emerge from UT and ORNL, resulting in faster commercialization of Solar Institute innovation. Dr. Patterson showed a graphic of the Farm site in Haywood County and noted the site directly edges Interstate 40 between mile-markers 42 and 45.

A schedule for the Solar Farm project was presented by Dr. Patterson. The RFP was released earlier this month for the award contract for the design and installation of the solar array and it is anticipated the contractor will be selected before the end of the month. After this selection there are several processes to be followed including National Environmental Protection Act guidelines, as the project is federally funded with ARRA funds, and with the Department of Energy to make sure those regulations are met as well. Post-FONSI (Findings Of No Significant Impact) procedures concerning environmental and other issues must also meet compliance guidelines. It is hoped site preparation and array installation can begin in September 2010 for a March 2011 completion of the connection with the TVA power grid. TDOT will start construction in spring 2011 of the Education and Welcome Center, and work is taking place in these

collaborations to ensure TDOT construction and the Solar Farm installation project are in tandem.

Dean Gourley asked Dr. Patterson about the fate of the solar panels should a natural occurrence take place such as a hailstorm. Dr. Patterson noted that she has also given thought to tornado disturbances. Damage to the solar panels in such circumstances would require maintenance and/or reinvestment.

Dr. DiPietro asked about the initiative's education component and, in particular, aspects concerning curriculum and materials development. Dr. Patterson noted that recruitment of specific staff to lead in this effort has also taken place. UT Agriculture and Extension staff will most likely also be utilized. Dr. DiPietro noted the valuable resources within UTIA/Extension to contribute to the development of this programming. Dr. Patterson noted she is enthusiastic about utilizing these resources and as well as other UT colleagues at its campuses across the state, particularly at UT Martin which is near the Solar Farm. The initiative, Dr. Patterson stated, is clearly going to be a collaborative effort. The education component development is anticipated to be finalized by April 2012.

Dr. DiPietro inquired about the initial plan for Genera Energy LLC to manage and operate the Solar Farm. Dr. Gentry noted that after some review it was decided that the Solar Farm operation is a better fit within the UT Research Foundation, particularly in view of the high volume of Genera Energy undertakings at this time and the heavy load Dr. Kelly Tiller, Genera Energy President and CEO, carries. Mr. Stansberry noted that UT's performance in the Genera Energy's projects were highly instrumental in UT's selection for the solar energy initiatives. Dr. Gentry noted that Genera Energy's experience in the Vonore biorefinery operation and other projects proved UT can work most successfully in large-scale project partnerships.

Mr. Stansberry thanked Dr. Patterson for her presentation.

VII. EPSCoR Update

Dr. Patterson also reported she was excited to provide an update on the National Science Foundation (NSF) EPSCoR Research Infrastructure Improvement Program proposal UT submitted last fall titled "Tennessee's Solar Conversion and Storage Using Outreach, Research and Education" and known in-house as "TN-Score." EPSCoR is an Experimental Program to Stimulate Competitive Research and it is a program that is open to states who receive less than their fair share of federal funding from a particular federal agency. For NSF, Tennessee is one of 29 states or jurisdictions which fall under EPSCoR. EPSCoR opens up programs and opportunities for funding that are not available to jurisdictions or states above a certain threshold. Although Tennessee has been EPSCoR-eligible since 2004, the award has been fairly elusive to Tennessee. The "grand prizes" of NSF EPSCoR are the Research Infrastructure Improvement Programs

awards, particularly the Track I proposals. UT put together a team in late summer 09 to prepare a proposal, believing the time was right in light of the Governor's investments in other projects at UT and around the state. The proposal was submitted October 19, 2009, and the funding level requested was the full-funding amount of $20M over five years. The proposal required a cost-share of 20 percent which was provided primarily by the UT system, the UTK College of Engineering (which stepped up with both cost-share commitments and significant assistance in proposal development), Vanderbilt University, the Tennessee Technology Development Corporation, and the UT Research Foundation.

Dr. Patterson said she is happy to report that after the NSF Committee's External Peer Review the EPSCoR Office recommended to the NSF Board that Tennessee's award be funded at the full amount. The NSF Board approved this recommendation and additionally approved the NSF Director's ability to make the award to Tennessee. The official award announcement is anticipated within the next month or two and the Tennessee team is most excited about receiving the NSF EPSCoR award.

TN-Score, Dr. Patterson noted, is a proposal with a statewide scope. During the proposal development specific barriers were identified in the state which limits the state's funding potential. One barrier identified was geographical parochialism and the lack of collaboration. A special theme of the proposal focused on creating a "culture of collaboration" through a fairly novel mechanism of the creation of network nodes. A unique aspect of the proposal was the integration of a diverse set of individual researchers, institutions and organizations. The proposal offered plans for better development of a well-prepared Science/Technology/Engineering/Math (STEM)-enabled workforce and incorporated programs to sustain long-term competitive research across the state. The basic intent of the EPSCoR proposal, and indeed a requirement of the proposal and rationale for the state's investment in many of the projects described within the proposal, is to evidence the development of a solid base support and platform which will create and contribute to additional funding opportunities and grow the state's economic development priorities. This intent led to the TN-Score research theme of alternative energy technologies with an emphasis on solar. The overall research theme was divided into three thrust areas: (1) Advanced Solar Conversion and Innovation, led by Drs. Barry Bruce at UTK and Kane Jennings at Vanderbilt; (2) Components and Devices for Energy Storage and Conversion, led by Dr. Tom Zawodzinski at UTK (a UT Governor's Chair) and Dr. Cynthia Rice-York at Tennessee Tech University; and (3) Nanostructures for Enhancing Energy Efficiency, led by Dr. Sandra Rosenthal at Vanderbilt and Dr. Nate Smith at Middle Tennessee State University.

Dr. Patterson showed a collaboration model diagram developed for the proposal. The model pairs a lead institution mentor (LIM; generally faculty mentors with well-established research programs) with a partnering university faculty (PUF; typically younger university faculty members considered up-and-coming stars). The model format is for the two paired faculty members to co-mentor graduate and undergraduate

students on research projects and to work together with outreach coordinators and a statewide management team to make a positive impact in the field of research and in growth of the state's economic development base. During the EPSCoR proposal development, more than 50 faculty members from across the state, representing more than 10 institutions, collaborated on the proposal. This is, as far as Dr. Patterson is aware, unprecedented collaboration within the state.

Management of the EPSCoR program will be by the University of Tennessee. Dr. Millhorn is the Principal Investigator on the award, Dr. Patterson noted. UT will be the central hub in the work by the state management committee that has representatives from the Tennessee Board of Regents, UT, Vanderbilt and other prime institutions within the state. Two of the three research thrusts will be led by UTK faculty (Dr. Bruce and Dr. Zawodzinski) and more than 14 faculty are named and involved as LIMS (UTK) or PUFs (UT Space Institute), with opportunities for additional faculty involvement as the grant matures. There is full support (salaries, tuition, supplies, travel) for 10 five-year Ph.D. fellowships as well as several undergraduate research opportunities. The grant also includes funding for large equipment and the overhead to be invested in additional Ph.D. fellowships to support the new joint energy sciences program.

Statewide programs to be offered (managed from UT) include Research Stimulation Awards which will be available to new faculty (hired within the past five years) at non-research institutions with less than $40 federal research funding (this includes basically all institutions within the state except UTK, Vanderbilt and the University of Memphis). There is planned support for M.S. students at Tennessee State University and Fisk to enter into a BRIDGE program whereby students can go straight from Master's degrees to Ph.D. programs at UTK or Vanderbilt. "Meetings-in-Miniature" will be offered where students and faculty can experience their peers, showcase their science (new inventions that can possibly be disclosed to UTRF), and where students can meet their future faculty mentors and mentors can meet prospective students and possibly recruit them as well. Grants will be offered for networking and cyberinfrastructure enhancements, and there is a vast array of K-12 outreach opportunities within the award. Tremendous industry support within the state has provided commitments for corporate summer internships for Ph.D. fellows working within the EPSCoR grant program. Summer research experience will also be offered for undergraduate students or rising freshmen will also be offered, as well as summer mini-sabbaticals for faculty at two-year community colleges or four-year primarily undergraduate institutions. These students will come to UT or Vanderbilt to learn research and/or teaching techniques and then return to their home institution with a starter grant for implementation of what they have learned. Summer programs will also be offered for Tennessee high school teachers. As part of the award outreach program, thrust leaders have agreed to visit high school classrooms during the grant's duration. A year-long undergraduate training program will be offered, and the Council for Undergraduate Research has agreed to provide a three-day workshop to institutions within the state directed at learning how to start a research program at a primarily undergraduate institution.

Dr. Patterson discussed other impacts the EPSCoR award will have for the state. The award will drive a large statewide research collaboration to build the foundations and relationships needed to enhance research success. The proposal will build on Tennessee's strengths, leverage the state's investments, align with recent industry recruitment successes, and address identified barriers (geographical parochialism, workforce development needs, etc.). Identified metrics will be monitored to measure outcomes/successes and make adjustments as they are needed to maximize success for the program. Dr. Patterson emphasized that the EPSCoR initiative is truly a statewide program in every aspect and it reaches out to all faculty across the state.

Dr. DiPietro asked about website development for the program. Dr. Patterson noted this aspect is included in the Year-One budget. Communication will be a key factor in getting out the word about the many opportunities and programs offered within the EPSCoR award to the appropriate institutions and individuals.

Dr. Patterson received congratulations and applause for receiving the award on behalf of the University.

Mr. Stansberry thanked Dr. Patterson for her presentation and commended both Dr. Millhorn and Dr. Patterson for the success of the EPSCoR proposal. It is a most important initiative for the University. Mr. Stansberry noted that one of the pleasures of his role as Chair for the Research, Outreach and Economic Development Committee is learning about the large number of exciting UT projects to choose from to bring before the Committee. Mr. Stansberry thanked Dr. Millhorn and his staff for the important work they are doing to advance the image of the University across the state and nation.

VIII. New Business

There was no new business.

IX. Adjournment

Mr. Stansberry thanked members for their participation in the meeting. The meeting adjourned at 4:45 p.m.

Respectfully submitted,

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