Replies to proposed amendments
ESE PhD proposal
October 18, 2010

Doug Birdwell has spent a great deal of time reading and studying our Energy Science and Engineering (ESE) PhD proposal, and I appreciate his efforts and suggestions. He has written a long analysis and critique, suggesting a number of changes. The purpose of this paper is to explain my reaction to his proposed amendments.

Background

In January 2010 the General Assembly of the State of Tennessee passed legislation authorizing UT to establish an academic unit of The University of Tennessee, Knoxville (UTK) for interdisciplinary research and graduate education in collaboration with Oak Ridge National Laboratory (ORNL) - the Center for Interdisciplinary Research and Graduate Education (CIRE). The goal is to use complementary resources at UTK and ORNL to increase science, technology, engineering, and mathematics (STEM) academic and research activities of national significance focused on energy-related science and engineering. The legislature appropriated $6.2 million of one-time funds for this new effort. On January 22 Chancellor Jimmy Cheek and ORNL Director Thom Mason appointed a Task Force to create and implement CIRE. The Task Force met on a regular basis for eight months to consider all aspects of the implementation of CIRE, including the CIRE mission, governance, faculty, curricula and degree programs, recruiting and admissions, student life, the research program, and the financial model. This included many interviews with leaders from energy-related industries and university energy research and educations centers, extensive discussions of a wide range of issues, and development of proposed CIRE policies and curricula. The cornerstone of CIRE is a graduate program leading to a PhD in Energy Science and Engineering (ESE). In addition, ESE *concentrations* will be offered in *existing* PhD programs for students who participate in and complete the core requirements of this graduate program. The 13 members of the CIRE Task Force are shown below.

Name	Affiliation	Title
Beierschmitt, Kelly	ORNL	Director, Nuclear Operations Directorate Executive Director of the High Flux Isotope Reactor
Daverman, Bob	UTK	Professor, Department of Mathematics
Davis, Wayne	UTK	Dean, College of Engineering Professor, Department of Civil & Environmental Engineering
Hodges, Carolyn	UTK	Vice Provost & Dean of the Graduate School
Keller, Martin	ORNL	Associate Laboratory Director, Biological & Environmental Sciences
Khomami, Bamin	UTK	Professor & Head, Department of Chemical & Biomolecular Engineering
Liu, Yilu	UTK	Governor's Chair Professor, Department of Electrical Engineering and Computer Science
Miller, Alex	UTK	Associate Dean of Academic Programs, College of Business William B. Stokely Professor of Management
Nichols, Jeff	ORNL	Associate Laboratory Director, Computing & Computational Sciences Directorate
Parang, Masood	UTK	Associate Dean & Professor, Academic & Student Affairs, College of Engineering
Roberto, Jim	ORNL	Associate Laboratory Director, University Partnerships
Sorensen, Soren	UTK	Professor & Head, Department of Physics
Stewart, Neal	UTK	Professor & Ivan Racheff Chair of Excellence, Department of Plant Sciences

Reaction to suggested amendments

Many of us have spent considerable time discussing the proposed ESE PhD program. Since my appointment as CIRE director on September 1, I have met with all science and engineering department heads in three colleges: Arts and Sciences, Engineering, and Agriculture and Natural Resources, in addition to the faculties in several of these departments. In the past week there have been many discussions pertaining to the amendments that Doug Birdwell has presented, including a three-hour session of Doug, me, and Soren Sorensen on Wednesday. Since that meeting, I have continued to discuss these issues with many others, including members of the Task Force that spent eight months developing the ESE degree program. So, my comments below are sometimes different from those on Wednesday, due to these subsequent discussions.

1. **Interim Credentials Committee (motion 2).** I think everyone realizes that we have no new faculty lines for CIRE and the PhD program, rather we will soon request applications from existing UTK faculty and ORNL researchers to serve also as our faculty. We had planned to use the Task Force (the Chancellor has appointed this body to be the initial CIRE Board of Directors) to kick start this process and pick the first set of CIRE faculty from the applications. The advantage of using this body as the interim Credentials Committee is that they have been involved in thinking about CIRE and the proposed PhD program since January, and so they are the most knowledgeable about the program and the goals and needs. While I prefer following this original plan, I agree that Doug Birdwell's proposal is also a workable one, and so **I accept his good idea**. After we form our initial CIRE faculty, then it is members of this faculty that will serve on the Credentials Committee.

2. **600-level coursework (motion 3).** I accept the language in the amendment: *Six of the nine hours of 600-level coursework must be offered by an engineering, science, or mathematics department at UTK/UTIA other than ESE.* That makes sense and that has been the intent of the Task Force - utilize existing coursework whenever possible. But, I cannot accept other language in this amendment, which limits 600 Doctoral Research and Dissertation credit to 24 hours, since that relates to the discussion of the minimum number of hours for coursework - this is related to my discussion of amendment 5 (item 4 below).

3. **Math courses (motion 4)**. **I oppose this amendment**. The Task Force thought about this for a long time and designed a curriculum with no formal mathematics requirement, and I agree. While Electrical Engineering does have a graduate math requirement, to my knowledge Physics, Biochemistry and Cellular and Molecular Biology, and Chemistry do not require math courses in their PhD programs, and it is the same story for Chemical Engineering, Materials Science and Engineering, and Computer Science in the College of Engineering. Of course, mathematics is a core part of physics, but we do not require a mathematics course for graduate credit in our Physics PhD. If the students come in weak in math and cannot get through the graduate physics courses, then mathematics courses will be prescribed.

4. **Hours for coursework (motion 5)**. The Task Force designed a curriculum that includes 36 hours of required coursework (beyond a bachelor's degree) with a minimum of 30 hours in the Core, Knowledge Breadth, and Specialization curricula. The intent was that the additional six hours (between 30 and 36) would be prescribed by the student's committee to allow more specialization courses or to fill a mathematics deficiency. While I told Doug on Wednesday that I could accept the amendment he has written, **I respectfully oppose this amendment** after many subsequent discussions.

   The Task Force spent considerable time surveying top universities in the country concerning their energy-related programs and their PhD course requirements in general. They found the number of 36 hours to be logical and sometimes even a little high compared to other programs.

   The Vanderbilt University Dean of the Graduate School (Dennis Hall) happened to spend Friday visiting me in order to learn about how we intend to operate this new PhD program, as they are interested in perhaps doing something similar. We talked a lot about coursework requirements for a PhD. I was surprised to learn that Vanderbilt requires only *24 hours of coursework* for their PhD, although departments can require more. In fact, the Physics and Electrical Engineering doctorates require 36 hours of coursework at Vanderbilt.

   Our goal is to recruit to UTK a high level of graduate student from top schools in the country, and we are starting to do that via an ORNL effort to visit 30 top universities this fall, to recruit for their own PhD hiring and also for our ESE PhD program. Our intent is to recruit a well trained graduate student that has a complete undergraduate preparation and is fully ready for our graduate course. I know that in our Physics Department 36 hours of coursework is sufficient for the best students that we sometimes attract. So, that is what the Task Force has designed - 36 hours of graduate coursework assuming a high level of recruited student. Of course, we will require more for those that happen to have less preparation.

   We intend for these top students to take the qualifying examination by the end of their first year, get actively involved in research at least by the summer after the first year, and pass the comprehensive exam by the end of their second year. The students will not be teaching assistants, so we feel that they will have the time to meet these goals. This is not much more aggressive than what we expect in the Physics Department, where the best students pass their comprehensive exam after semester #4 or 5.

Lee Riedinger
Professor of Physics
Director of Center for Interdisciplinary Research and Graduate Education