PROGRESS ON RECOMMENDATIONS FROM THE 10/12/2012 MEETING OF THE CU-BOULDER ENGINEERING ADVISORY COUNCIL

The key recommendations of the CU-Engineering Advisory Council (EAC) at its 10/12/2012 meeting are provided below in italics, followed by summaries of the progress and plans made to-date on these recommendations. This summary report, prior reports, and other EAC information are posted at http://www.colorado.edu/engineering/about/engineering-advisory-council.

College Update:

- **Articulate the case for growth**
  The case for enrollment growth is based on two principles:
  1. **Improved Reputation:** Rankings of engineering colleges depend, in part, on size. Expanding our college will enhance its reputation and also improve the overall student quality and reputation of the University of Colorado Boulder.
  2. **Higher Demand:** Applications to our college have more than doubled at both the undergraduate and graduate levels since 2005. Moreover, the U.S. Bureau of Labor Statistics projects a 5-62% increase in engineering jobs in the next decade, depending on the discipline, and major employers have noted that about half of its engineering workforce will be eligible for retirement within 10 years. This case will be articulated in college publications (e.g., the 2013 CUEngineering magazine).

- **Form an EAC task force on growth strategy to report its recommendations at the next EAC meeting**
  The Growth Strategy Task Force was formed and has developed recommendations that will be discussed at the April 2013 EAC meeting and posted on the EAC web site.

- **Survey student interest in the proposed General Engineer degree as a pathway to teaching; quantify demand for secondary math and science teachers**
  A survey was sent to the 3,382 current CU undergraduate engineering students in November 2012 and 24.3% responded. Results indicated strong interest in a General Engineering degree: 27% of respondents “agreed” or “strongly agreed” that they would have been interested in enrolling in a General Engineering degree program, 48% of respondents “agreed” or “strongly agreed” that they would like the flexibility to customize their engineering degree programs, and 25% of respondents “agreed” or “strongly agreed” that they would be interested in earning a grades 7-12 science or math teaching license. In addition, the need for math and science teachers was quantified in our General Engineering Plus degree proposal.

- **Compare our research proposal success rates to those of peer institutions**
  Using CY 2011 and CY 2012 data from the NSF, we compared submission rates of CEAS faculty versus those of engineering colleges at Pac-12 institutions as well as institutions of our aspiration group (as defined in the CEAS strategic plan). The data show CEAS faculty submission rates exceed that of most peer institutions: 0.50 (proposals per faculty member per year) for CEAS faculty, 0.42 for Pac-12 colleges, and 0.37 for our aspiration group. Moreover, our success rate is significantly higher than the average: CEAS: 30%; Pac-12: 23%; aspiration group: 21%.

CU Financial & Facilities Update:

- **Close the gap between resident and nonresident tuition; resident tuition should be the cost of education**
Over the past five years, resident engineering tuition has increased 47% from $7.5K to $11.0K per year, while nonresident engineering tuition has increased 29% from $25.2K to $32.5K per year. The cost of education per student is approximately $20K per year. Thus, the gap between resident and nonresident tuition has widened in absolute terms, but resident tuition is gaining on the cost of education. The Regents (who set the tuition rates) are also concerned about keeping tuition affordable for Colorado residents.

- **Reallocate funding from units with declining enrollments**
  In the College of Engineering and Applied Science, this reallocation occurs through our budget formula that distributes resources based on enrollments and other factors. At the campus level (for which this recommendation was directed), there is not (yet) a similar formula to reallocate funding from units with declining enrollments to those with growing enrollments. However, the College of Engineering and Applied Science has been successful in the past year in obtaining new funding from campus for its recent and projected growth.

**Retention Update:**
- **Seek campus approval for the new Global Engineering RAP for Fall 2014; include 1st year engineering project course as part of the RAP curricula**
  The Global Engineering RAP was approved in November 2012, and will open in August 2013 in the new Kittredge Central residential building located next to Andrews Hall. Target size for the first year is 28-38 students. As of April 1, 20 students have accepted the offer to live in the RAP and speak Spanish full time. Of these, 40% are women and 25% are returning engineering students. The Sustainable by Design RAP and the new Global Engineering RAP both integrate the 1st year projects course into their curriculum.

- **Require college advising for students who are considering transferring out of engineering**
  A new intervention process was introduced in Spring 2013 for students considering leaving the College. As students are identified by academic advisors (and others who come into contact with students) to be considering leaving the College, the students are given a “Thinking of Leaving” flyer and are requested to fill out a short online survey, after which each student is asked to meet with Dan Watson, Academic Programs Coordinator or Lelei Finau-Starkey, First-Year Experience Coordinator. Dan or Lelei follow up on the student’s survey responses, offer guidance and assistance, and potentially dissuade the student from leaving, if appropriate. This survey link is also posted on the Intra-University Transfer (IUT) website of the College of Arts & Sciences (which is where more than 90% of our students transfer if they stay on campus) as a requirement for engineering students to complete as part of the IUT process. To date, 24 students have taken the survey and 11 have been interviewed. The intervention process will be assessed at semester’s end.

- **Follow-up on additional 2012 Retention Task Force Recommendations is underway, with a full report to the EAC before the Fall 2013 meeting.**

**Provocative Actions:**
- **Re-examine 1st year student requirements and emphasize programs that build community**
  In 2012, the New Engineering Student Orientation was expanded to include on-site course registration and earlier student meetings with academic advisors in individual departments and programs. Orientation also now includes an “Academic Expectations” session, where instructors of 1st year engineering courses share
information, offer tips, and answer new students’ questions. A sample of 1st year experience programming for engineering freshmen includes: “The Happy Engineer” and “Stress Busters” workshops from Counseling & Psychological Services; a campus-wide “extended orientation” fall program; and the new Engineering Peer Advocates program to provide informal mentoring from upper-class engineering students during drop-in office hours in the BOLD Center. In addition, the new Global Engineering RAP will come online in fall 2013, supplementing the Andrews Hall Residential College and Quadrangle Engineering & Sciences Living and Learning Community, which enjoy a higher retention rate for engineering students.

- **Revise performance management system and awards to increase expectations and rewards for teaching/mentoring excellence**
  The performance-management system for faculty and professional staff was overhauled in 2012 to place a greater emphasis on goal setting and self-evaluation, and with richer feedback from supervisors. In addition, performance-improvement plans are now required for all faculty members rated below expectations in any single category (teaching, research, service) and not just overall. With respect to rewards for teaching/mentoring excellence, several college-wide awards in teaching and advising have been added in the past few years. More recently, the best practices of those departments with such rewards already in place have been shared with the other units, and the Dean’s Office has coordinated the required request to campus to approve extending the slate of awards (undergraduate teaching, graduate teaching, student mentoring/advising, research, outstanding junior faculty member, distinguished performance, outstanding staff member) to all departments starting in 2013.

- **Increase investment for targeted research efforts with dollars and hiring of key faculty/staff**
  Faculty searches are currently underway supporting the key strategic areas of energy/environment, materials, biotech, and aerospace, as identified in *Engineering 2020*. These faculty searches are not tied to specific departments and are being broadly supported across the College. Additionally, a new staff position has been added to the ADR office to support large research proposal development across the College.

- **Focus research on global challenges that require large, multi-disciplinary research collaborations**
  The Associate Dean of Research (ADR) office has continued to initiate and form teams around large, multi-disciplinary proposal opportunities. For example, in March 2013, nine CEAS faculty plus two additional CU faculty (RASEI and ATOC) joined the University of Kansas-led team of 12 universities to submit a $20M proposal (over five years, plus five-year optional renewal) for an FAA “Center of Excellence on Alternative Jet Fuels and Environment.” Other recent and on-going large multidisciplinary research support has focused on threat detection and big-data algorithms, water-sustainability-climate, environmental effects of hydraulic fracturing, and developing connections with the Colorado School of Public Health for environmental-engineering collaborations.

- **Establish a resource center for teaching/learning excellence and use college classrooms as a showcase for on-line initiatives, multi-disciplinary teaching teams, and industry-guided teaching modules**
  The Associate Dean for Education (ADE) office is building a database of engineering research publications and creating abstracts on best practices for use by faculty. An expert on online education and MOOCs (Massively Online Open Courses) has been hired by CEAS to consult with faculty and is establishing a resource center for developing flipped classrooms. We have secured use of a faculty teaching resources
classroom in the Engineering Library that has 25 laptop computers with course development tools, and a consulting room for developing flipped classrooms in partnership with Chemical Engineering faculty. We plan to introduce MOOC development as more CEAS faculty engage with the campus Coursera initiative.

CU Foundation:

• **Develop a strategy for securing small annual gifts over many years**
  
  We have a 2014 plan with programs for both annual and leadership giving that will be rolled out in the upcoming EAC/RDC meeting.

• **Develop a strategy for developing long-term relationships to realize large gifts**
  
  In the past, turnover in the development team has impacted long-term relationship building. The Dean and several chairs and directors are working more closely with the development team in engaging current and potential donors to ensure continuity in relationship management. University leadership has brought in an outside consultant to evaluate fund-raising efficacy system-wide.

Education Committee:

• **Integrate ATLAS Technology, Arts, & Media (TAM) program into the fabric of our College and consider expanding it into an interdisciplinary major**
  
  A proposal for a new undergraduate major within CEAS is under development for which current TAM courses will be the foundation. Two TAM representatives now attend the meetings of the CEAS Undergraduate Education Council, the ATLAS Director is a member of the Engineering Administrative Council, and relevant CEAS policies related to undergraduate education now govern ATLAS. ATLAS is also an integral part of the proposed Fleming interdisciplinary projects space.

• **Proceed with General Engineering degree with licensure**
  
  The College has submitted a proposal for a General Engineering Plus degree program to the Board of Regents for consideration at their April 2013 meeting and potential final approval in July 2013.

• **Proceed with Engineering Track for Business Minor**
  
  A 12-credit business minor for non-business majors will be available for students beginning Fall 2013. The proposed “engineering track” that substituted a project management course for one of the business courses, was not approved by business faculty. There was resistance to award a business minor with less than 12 credit hours taught by business faculty. Engineering students may still pursue the business minor with an entrepreneur, analytics, or innovation track.

• **Explore BS/MBA program for engineering students**
  
  The current MBA program offered by the Leeds School of Business requires three years of industry experience prior to application. A joint Leeds/CEAS task force is benchmarking business/engineering collaborative programs offered by peer institutions along with industry skill requirements in order to make recommendations on other programs to improve the business acumen of engineering students and the technical foundation of business students.
International engineering should include a global engineering certificate, targeted recruitment and orientation of international students, increased study abroad, internship opportunities, and on-campus international experiences for domestic students

A “Global Engineering” strategy for the College is being developed for review by college leadership. The strategy will address how to improve and increase the international experiences for engineering students going abroad; improve recruitment and program offerings for international degree-seeking students coming to CEAS; and improve the global competency of the other CEAS students. The 15-credit undergraduate Global Engineering Certificate Program was approved by CEAS and is under review at the campus level. The certificate program is slated to start in Fall 2013.

Research Committee:

- Complete a SWOT (Strengths, Weaknesses, Opportunities, Threats) to identify research threads across our college and prioritize best opportunities

Engineering 2020 identified six key strategic areas of excellence for the College: Materials Science, Bioengineering and Biotechnology, Aerospace Systems Science, Energy Systems and Environmental Sustainability, Computational Science, and Engineering Education Research, and significant progress has been made in developing specific programs in these areas. Further work will be undertaken this summer to identify and prioritize the best targeted opportunities for the College within these areas.

- Invest in proposal preparation – especially large efforts

Approval has also been secured for a new Proposal Development Manager position in the ADR office, which will provide expertise in large proposal writing. This position is expected to be filled by August and will add to the pilot effort of providing centralized support for preparing proposals for the upcoming NSF Engineering Research Center solicitation. A call for internal white papers was issued and three teams responded. All teams will receive central support from the ADR office for preparing a pre-proposal. One team will be supported in preparing the full proposal.

- Team with other institution on major initiatives

CEAS faculty routinely team with other institutions when responding to major research initiatives. The ADR office has been supporting CEAS faculty in finding partners at CU and other institutions.

BOLD Advisory Council:

- Establish a business case for raising more funding for BOLD scholarships – especially targeting accepted in-state women

BOLD participation scholarships help students select CU Engineering and stay the course and take the risks inherent in pursuing a challenging engineering path. BOLD scholarships have been pivotal in changing the gender and ethnicity make-up of our student body: in fall 2012, female students offered BOLD scholarships were twice as likely to choose CU Engineering (102% higher yield), while the yield was 75% higher for minority students with scholarships than without. Students who receive BOLD scholarships are also more likely to be retained in engineering and ultimately graduate. Recipients who started at CU Engineering in fall 2011 had a second-year retention rate of 88%, higher than the 86% college retention. Recipients achieved differentiated academic success, with a first-year average 3.2 GPA—higher than the 3.0 average for all fall 2011 first-year engineering students. The fall 2010 entering BOLD scholarship cohort had an even higher retention rate of 93% and an average GPA of 3.3 (much higher than the college 84% retention
rate and a 3.0 GPA). Longer-term, 56% of BOLD scholarship recipients who started in fall 2007 had graduated within five years, the same as our college five-year graduation rate of 56%.

- **Work with Admissions Office on better marketing and messaging for our college including a virtual tour of our college**
  Little progress has been made. The Integrated Teaching Lab Program has piloted the development of an “explore the thrills of engineering” touch-screen video kiosk that will be further developed in summer 2013 and rolled out for prospective (and current) students for the next recruiting cycle.

- **Increase pre-Calculus offerings to better prepare students for success**
  The second (and much improved) offering of Pre-Calculus for Engineers was hosted by the BOLD Center, in partnership with the Applied Math department, for the first-year GoldShirt students in Fall 2012. The course was quite successful and will be expanded in Fall 2013 to a college-wide offering of eight sections of 35 students/section. This offering will provide better support for the ~15% of our direct admit students who are not yet ready for APPM calculus, GoldShirt students and students in the new Pre-engineering Program. The course design incorporates use of online resources, including the “intelligent tutoring” features of ALEKS, which supports students to understand and improve their own specific areas of math weakness.

- **Incentivize departments to improve diversity recruitment and retention**
  Work will be completed this summer to identify departmental metrics that encourage retention but do not penalize departments for upholding high standards and for appropriately advising and supporting freshmen as they sort out their long-term interest in engineering. The College has a flexible first-year engineering curriculum and encourages students to consider change of majors as their interests develop.

- **Extend diversity training beyond new faculty**
  The College has presented four sessions this year on the effectiveness of NSF-funded ENGAGE strategies as part of the ongoing, professional-development lecture series.

- **Re-ignite the college-wide Diversity Action Committee**
  This action will be undertaken during the summer.

**Resource Development Committee:**
- **Engage EAC members to match corporate executives with our College’s portfolio and programs**
  The development team is working with EAC members to better understand their companies’ priorities and then provide access to and information on programs of potential interest. These efforts have broadened awareness of new areas that may provide their companies with additional benefit and, simultaneously, benefit the College. More specifically, since the Fall 2012 EAC meeting, we have hosted corporate visits by current/prospective EAC members from Amgen, Boeing, ConocoPhillips, IBM, Lockheed Martin, LSI, MarkWest, Shell, and SparkFun, with a particular goal of matching company interests with our college’s strengths.