Testimony by Dr. Z. B. Kremens
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Honorable Senator Bye, Honorable Representative Willis, distinguished members of the Higher Education and Employment Advancement Committee. I am Dr. Z. B. Kremens, Dean of the School of Engineering and Technology at Central Connecticut State University (CCSU) and professor of electrical engineering. Thank you very much for the opportunity to testify today on House Bill No. 6256, *An Act Concerning Workforce Development.*

I would like to comment briefly on the STEM workforce development challenges with reference to relevant undertakings, successful projects and major accomplishments of my school during the past 12 years. The School of Engineering and Technology at CCSU is the only one of its type in the Connecticut State University System (CSUS) and one of only two Connecticut public schools of engineering in the state, in addition to four engineering schools at independent universities and one at the Coast Guard Academy.

My testimony will address two main aspects of workforce development as I see it from the perspective of a four-year higher education institution. They are: responsiveness of higher education institutions to the state workforce needs and the challenge of recruiting students to STEM disciplines.

Responsiveness to state workforce needs in STEM disciplines

As a public institution of higher education, CCSU has an obvious obligation to closely monitor trends and projections in Connecticut workforce needs and to respond accordingly, given the timeframe of the educational process.

- Planning

It is essential that newly developed or modified programs result from the careful and precise prediction of Connecticut's needs and global trends. As early as 2001, the School of Engineering & Technology developed a new strategic plan, which included, among others, two important goals: responsiveness to workforce needs in Connecticut and doubling the School of Engineering and Technology's enrollment. In 2008, CCSU adopted four distinctive elements for the University's strategic plan; one of them is workforce development. Naturally, the School's new strategic plan maintains this goal as one of our top priorities.

- CT workforce needs

All statistics indicate a dramatic shortage of highly-qualified STEM graduates who've attained bachelor's degrees or higher. Multiple reports indicate that the number of graduates in engineering disciplines barely meet or are well below the number of job openings, and that is without even considering the fact that, excluding CCSU, almost 50% of university graduates leave our state shortly after graduation. I would point out that at CCSU's School of Engineering & Technology over 90 percent of our students are state residents and 85 percent of our graduates remain in Connecticut and work, pay taxes, and otherwise enrich our state.

In 2005 the *Battelle* consultants noticed that "Connecticut employs 1.7% of engineering workers in the nation, but generates only 0.8% of engineering graduates in the nation."

A very recent report by Georgetown University shows that by 2018, 67% of all jobs in our state will require some kind of postsecondary education (including 27% with a bachelor's degree and 15 % with a master's or higher degree). These numbers clearly illustrate the scale of the problem we are facing. Additionally, a 2010 study by MIT concludes that there is a progressing trend of job polarization in the USA, "with job opportunities increasingly concentrated in relatively high-skill, high-wage jobs, and low-skill, low wage jobs."

- Engineering and other new programs at CCSU

Following the well-documented shortage of mechanical engineers in Connecticut, the CCSU School of Engineering & Technology developed a BS in mechanical engineering program, and it was approved by the Board of Governors of Higher Education in 2006. At that time, we projected an enrollment of 60 students in four years. I am proud to report that we now have over 170 students in that program, despite the very high academic criteria for admission. Last year we were granted professional accreditation for this program by EAC of ABET. In late 2009, the DHE approved another engineering program that we had developed, the BS in civil engineering. The first full cohort was recruited in 2010, and now we have over 60 students in that program. Based on industry input, we are currently in the process of submitting a program in Robotics and Mechatronics Engineering Technology. I would also like to mention that we offer the only program in the state in Construction Management, and it currently enrolls over 250 students.

- Connections with local industries

Industrial advisory boards provide direct contact between our school and Connecticut's industries. They provide valuable input regarding programs, courses, and extracurricular activities. Our advisory board members articulate industrial needs, expectations, and concerns. We have eight discipline-specific, industrial advisory boards involving 120 professionals who meet regularly with faculty and students. In addition, we maintain strong connections with various companies through internships, co-ops, and job placement services for our students.

To conclude, I would especially like to point out that to retain existing businesses and attract new companies to Connecticut we need to think beyond the approach of matching the number of graduates with the number of projected openings in STEM. An abundance of STEM graduates will make Connecticut a more attractive place for new investments, new businesses, and job creation, and will go a long way to restore Connecticut to its historic place as a leader in innovation.

Recruitment of qualified students to STEM programs

To put our challenges, and the progress we made, in the right perspective, I would like to quote two national statistics: "Nearly one-third (33%) of students entering some type of postsecondary education need to take remedial courses." (*College Readiness, 2006 by ACT, Inc.*) "....fewer than 15% of U.S. high-school graduates have the science and math background to even consider going to engineering school." (*Charles M. Vest, President, NAE at ABET Meeting, November 2, 2007*).

- Between 1998 and 2010, the School of Engineering and Technology has increased enrollment from about 600 students to over 1500. Every year, enrollment has been steadily growing between 5% and 10%. Because statistics indicate that successful STEM students start very early in their preparation for college--as early as middle school--we are reaching out to prospective students through innovative and engaging activities and programs, such as:
    - LEGO Robotics state competition for middle school students (since 1999)
    - BEST Robotics state competition for middle and high schools students (since 2005)
    - VEX Robotics state competition for last three years (next on April 3, 2011)

- Girls in Tech Expo for middle school female students for last three years (on April 8, 2011 we will host 130 students)
- "Go for Aerospace" recruitment program in collaboration with NASA for underrepresented talented students is currently in the third year and brings some 40 students a year to CCSU.

- The school offers an array of engineering, engineering technology and technology programs. It helps in retention by enabling internal transfers. This is the best strategy for the regional school, which serves a very diverse population of traditional and non-traditional students. We provide educational opportunities for many students who bring various sets of skills and interests. The numerous academic options combined with the quality of accredited programs are very attractive for prospective students.

- Transfer students constitute an important and large group of our students. For over 15 years the School of Engineering and Technology has actively participated in and strongly supports the *College of Technology* articulation agreement with all CT Community Colleges. This pathway program offers various options (engineering, engineering technology, and technology) and, consequently, CCSU is the largest recipient of all transfer students under the *College of Technology* program. As a matter of fact, the annual meeting of all community colleges site coordinators will take place at CCSU on March 11.

- Based on the National Academy of Engineering, the practical aspect of engineering education is extremely important. Our programs are designed to maintain an appropriate balance between theory and application. Almost all of our academic programs are accredited by recognized national professional accreditation organizations.

- The school makes every effort to ensure that our programs are accessible to Connecticut's diverse population. We work directly with secondary schools, mainly in Hartford and New Britain, to encourage students to enter technological fields of study.

- The financial aspect of education is very important; a majority of our students must hold down jobs to pay their tuition. We actively participate in fundraising activities with the main goal of providing more scholarships to our students. The scholarship fund helps in recruitment and retention of talented students, especially from underprivileged groups.

- Finally, we capitalize on unique attributes of the School of Engineering and Technology at CCSU, such as: affordable tuition, convenient location for commuters, part-time option, evening courses, individual advising, and convenient internal transfer between the majors in the school. Given demographic changes in Connecticut and our position in the state, we continuously focus on recruitment of underrepresented and underprivileged groups, including our traditional population of first generation college students who are primarily from central Connecticut's urban areas.

Thank you for giving me the opportunity to speak today, and I would be happy to answer any questions you may have.