

**CLEMSON UNIVERSITY**

**College of Engineering and Science**

**REQUESTING APPROVAL OF A NEW CENTER**

**Clemson University Center for Workforce Development**

Submitted to the South Carolina Commission on Higher Education

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## I. CLASSIFICATION

This proposal requests South Carolina Commission on Higher Education Center (CHE) approval for the *Clemson University Center for Workforce Development* (CUCWD).

As a research unit at Clemson University, CUCWD has been in existence for less than one (1) year. The proposed Center is **NEW** in terms of CHE designation. The date of designation of CUCWD as a CHE approved Center will precede the proposed date of implementation: August 2012.

CIP code: not applicable

## II. JUSTIFICATION

### IIa. Purpose/Objective:

With initial funding from the National Science Foundation (NSF) Advanced Technological Education (ATE) program [\$2.4M], and the Department of Labor (DOL) Trade Adjustment Assistance Community College and Career Training (TAACCCT) grants [\$1M], Clemson University proposes the creation of the Clemson University Center for Workforce Development (CUCWD). The collaborative team consists of Clemson University, Florence-Darlington Technical College, Greenville Technical College, Trident Technical College; in partnership with Advance Technological Education (ATE) National Center for Aerospace Technical Education (SpaceTEC®), National Center Automotive Manufacturing Technical Education Collaborative (AMTEC), Consortium for Alabama Regional Center for Automotive Manufacturing (CARCAM), and the South Carolina Automotive and Aviation (A<sup>2</sup>) industry. CUCWD proposes to develop a Regional Center for E-Learning to conduct advanced A<sup>2</sup> technical education using virtual classrooms, personalized learning and E-learning technologies. This effort focuses on industry clusters with significant investments in SC. Because the southeast is a hub of automotive and aviation industry, CUCWD emphasizes creating advanced curriculum delivery technologies, evaluating existing instructional material, and assessing teaching practices and workplace preparedness for the modern A<sup>2</sup> industry. CUCWD will work closely with other state-wide workforce development and educational entities including eight SC Technical College Partners, the SC Department of Education (K-12), the SC Equity Resource Center, the SC Department of Commerce, and the SC Center for Accelerated Training (CATT).

The CUCWD mission is four fold: (1) to expand automotive/aviation technician education programs capacity with partnerships with technical colleges via innovative, readily available, and cost-effective e-learning options, (2) to increase access, support recruitment, and learning for students in automotive and aviation technician education programs by creating a South Carolina Aviation and Automotive (SC-A<sup>2</sup>) Network, (3) to broadly disseminate advanced technology e-learning modules for use by automotive and aviation technician education programs and industry, and (4) to advanced CUCWD towards long-term sustainability. CUCWD is structured to capitalize on and unify the already existing expertise in unique and cutting edge visualization and simulation technologies as well as Clemson University (CU) strengths in online-based teaching technologies and engineering education.

Unique aspects of the Clemson University Center for Workforce Development (CUCWD) will include:

- CUCWD is funded by the National Science Foundation (NSF) Advanced Technological Education (ATE) program [\$2.4M], and the Department of Labor (DOL) Trade Adjustment Assistance Community College and Career Training (TAACCCT) Grants [\$1M]
- Establishment of three satellite center locations at the Clemson University International Center for Automotive Research (CU-ICAR) in Greenville, SC, the Florence-Darlington Technical College in Florence, SC, and the Clemson University Restoration Institute (CURI) in Charleston, SC to best serve the needs of the state and industry as it relates to workforce development.
- Designation of enabling technologies as crucial research thrust areas.
- Crucial partnership of K-12 organization, 2-year community and technical colleges, Clemson University, industry partners.
- Establishment of a student recruitment/retention program with regional and economic focus.

### **Iib. National and State-level Need:**

Industry and Occupational Projections compiled by the South Carolina Department of Commerce Labor Market Information Office for 2006 to 2016 indicate that job growth in South Carolina will increase at a slightly higher rate than in the rest of the U.S. The state is expected to add more than 200,000 jobs, representing a growth of 11% compared to 10% nationwide. Indeed, labor statistics seems to bear this out; South Carolina job growth for 2007 was at its highest rate in six years, up 2.3 percent to more than 1.95 million. Capital investment in South Carolina grew by 35 percent during the same year to more than \$4 billion, representing more than 15,000 new jobs. Clearly the technical education community in South Carolina must meet this growing demand by ensuring that it produces a well-trained and qualified technical workforce. Indeed, despite the economic downturn, South Carolina's business environment has proven to be particularly robust. BMW in Spartanburg has announced expansion plans, Proterra, a new electric bus company has recently moved to Greenville, the ZF Group announced the construction of a transmission plant creating 1000+ jobs, Boeing announced the biggest expansion in its recent times with plans to add 6000+ jobs at its new facility in North Charleston, representing the biggest capital investment in South Carolina.

Two knowledge sectors in which much of the state's growth is reflected are the automotive and aviation industries. The transportation equipment manufacturing industry, for example, employed more than 40,000 South Carolinians in 2010. More than 51 firms involved in transportation equipment manufacturing relocated or expanded in South Carolina during the last three years, investing almost \$2.7 billion and creating more than 4,500 new jobs. South Carolina's knowledge economy is based upon the synergistic automotive [e.g. BMW, Michelin, Honda, BOSCH] and aviation [e.g., Lockheed Martin, Boeing, Honeywell, GE Energy/Aviation] industries, both of which have seen explosive growth since 2000 and require similar technical skills.

Most importantly, because the automotive/aviation technician skill set is portable, multiple career options for students are available. Employment opportunities for both automotive and aviation technicians are expected to grow most rapidly in the southeastern United States, and in S.C. specifically. The state currently needs 2,000 to 5,000 automotive technicians; this number is expected to grow annually as the number of vehicles and their complexity increase. Projected growth for automotive technician occupations in SC is expected to be 8% for the period 2008-2012, as shown in Figure 1. Projected growth for aviation technician occupations statewide is expected to be approximately 7% for the period 2008-2012, as shown in Figure 1.

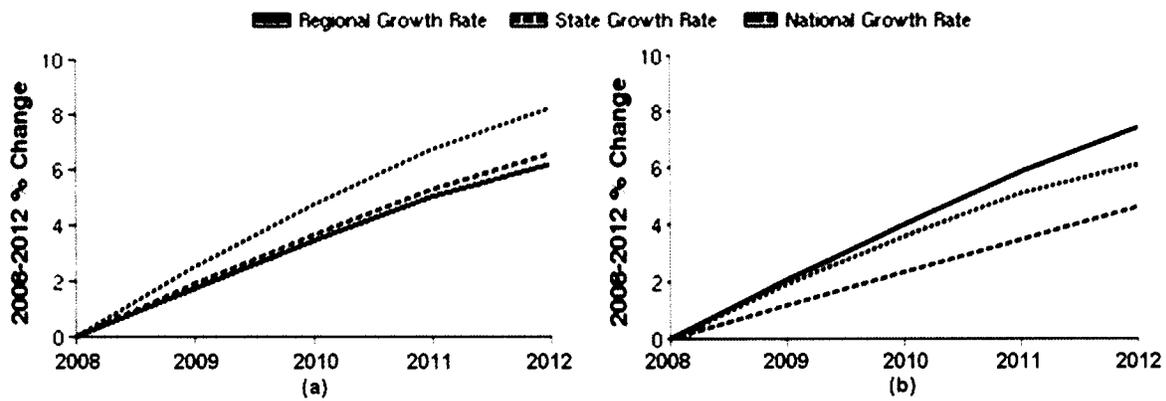


Figure 1. (a) Automotive Technician Job Growth and (b) Aviation Technician Job Growth

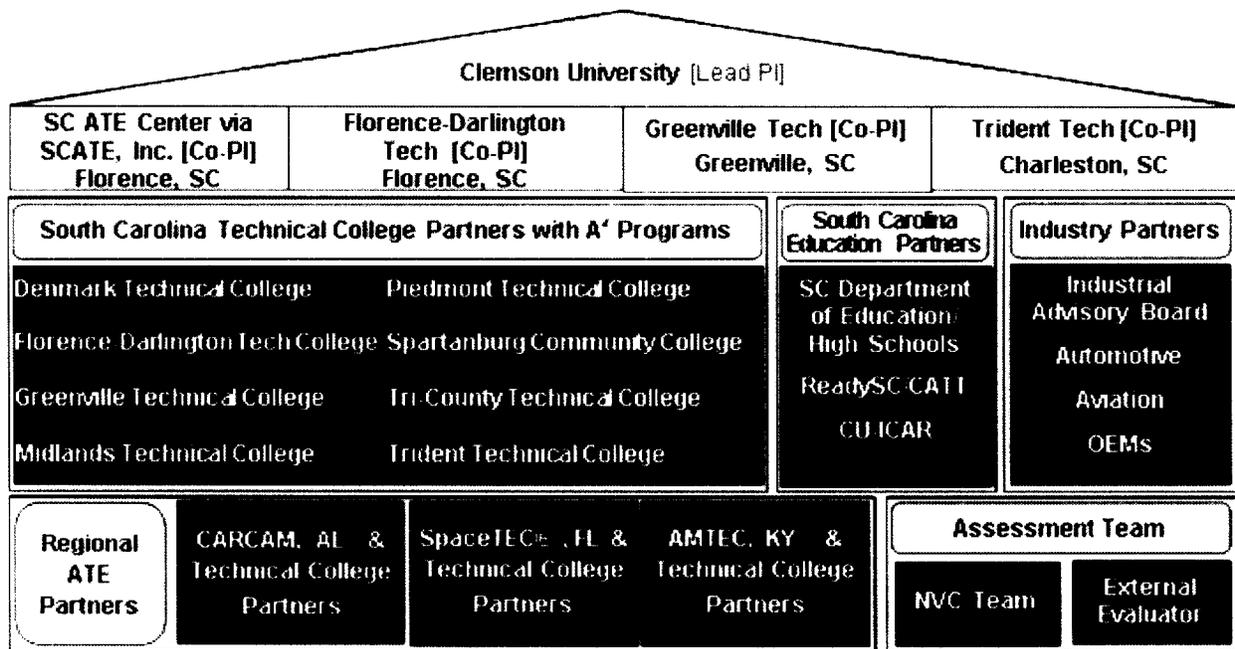
The Clemson University Center for Workforce Development (CUCWD), as a resource center, will provide advanced technological resources for many South Carolina students, particularly those underrepresented (by race, gender, or economics) in the Science, Technology, Engineering, and Mathematics disciplines. Workforce demands in technology programs supported by CUCWD are high, while the current rate at which the state is able to produce these highly skilled workers remains low. Students in programs affected by CUCWD will acquire the technical skills and general competencies that will afford them employment opportunities in a variety of industries.

### IIC.1 Relationship of Proposed Program to Existing Programs at Clemson University

As an inter-disciplinary research unit of the College of Engineering and Science at Clemson University that spans across Colleges, the Clemson University Center for Workforce Development (CUCWD) already integrates faculty and student researchers across many departments and programs. The Center will include faculty from the Departments of Industrial Engineering, Mechanical Engineering, Automotive Engineering and Computer Science. Additionally, CUCWD has created partnerships with the Clemson University International Center for Automotive Research (CU-ICAR), the Clemson University Restoration Institute (CURI), Youth Learning Institute (YLI), Programs for Educational Enrichment and Retention (PEER) & Women in Science and Engineering (WISE), the Academic Success Center and the South Carolina Center of Excellence in Mathematics and Science Education for maximum impact. The CUCWD Director also serves as the Associate Vice President for Workforce Development and reports to the Provost/Vice President for Academic Affairs and the Vice President for Economic Development.

### IIC.2. Relationship of Proposed Program to Other Institutions

The Clemson University Center for Workforce Development (CUCWD) has created a unique partnership with eight (8) technical and community colleges in the state, other Advanced Technological Education (ATE) centers in Kentucky (National ATE Center, automotive), Alabama (Regional Center, automotive) and on the Space Coast of Florida (National Center, aerospace), and anchor companies in the state. The CUCWD organizational structure is shown in Figure 2.



**Figure 2. CUCWD Center Organizational Structure**

**IId. Centrality to Clemson University Mission:**

The Clemson University Center for Workforce Development (CUCWD) is an integral component of the Clemson Academic Plan by meeting two emphasis areas: *Automotive and Transportation Technology* and *General Education*. Additionally, CUCWD aligns with Clemson University’s land-grant mission of establishing a “high seminary of learning” and to “develop the material resources of the state.” By partnering with 2-year colleges, CUCWD aims to create a highly skilled workforce of technicians, engineers and scientists.

CUCWD will thus address the needs of the state by meeting the CHE guidelines of:

- Creating a well-educated citizenry,
- Raising the standard of living of South Carolinians,
- Improving the quality of life,
- Meeting changing work force needs,
- Creating economic development opportunities,
- Positioning the state to be competitive in a global economy, and
- Fashioning a new generation of public sector and private sector leaders.

The objectives of the Clemson University Center for Workforce Development (CUCWD) will be achieved through goals of center:

- (1) *Creating a CUCWD Virtual E-School by expanding automotive/aviation technician education programs at technical colleges via innovative and cost-effective E-learning options to support the automotive/aviation curriculum. The focus is to develop/deliver E-learning modules with virtual reality or similar high-level visualization/simulation tools for aviation and automotive (A<sup>2</sup>) fields for region-wide implementation/evaluation;*

- (2) *Increasing access to support recruitment and learning for automotive and aviation students through this SC-A<sup>2</sup> Network.* CUCWD will make E-learning lessons available to high school teachers, use E-learning to increase the accessibility of aviation and automotive (A<sup>2</sup>) technician education programs for students in programs at capacity enrollment, for students in remote schools and underrepresented groups/communities, for students that will benefit from alternate teaching methodologies, and for students facing challenges in attending courses on campus;
- (3) *Broadly disseminating advanced technology E-learning modules for use by automotive and aviation technician education programs and industry* by implementing modules across SC via strategic partner networks to provide industry partners with options so that the CUCWD Regional ATE Center may develop learning modules for their training needs;
- (4) *Advancing the long-term sustainability of CUCWD.* CUCWD will aim to become self-sustaining through research grants, contract research services, and indirect funds generated on sponsored programs and projects.

## **Iie. Similarities/Differences with Those Programs at Other Institutions**

The Clemson University Center for Workforce Development (CUCWD) has partnered with the Departments of Industrial Engineering, Mechanical Engineering, Automotive Engineering and the School of Computing at Clemson University, with eight (8) technical and community colleges [Florence-Darlington Technical College, Greenville Technical College, Trident Technical College, Spartanburg Community College, Denmark Technical College, Piedmont Technical College, Midland Technical College and Tri-County Technical College], and three (3) Advanced Technological Education (ATE) Centers [National Center for Aerospace Technical Education SpaceTEC®, National Center Automotive Manufacturing Technical Education Collaborative AMTEC, and Consortium for Alabama Regional Center for Automotive Manufacturing CARCAM]. Funded by NSF and DOL, it brings together technical colleges, state-wide partners and the automotive and aviation industry in a unique collaborative center to address the workforce needs of South Carolina.. The CUCWD organizational structure is shown in Figure 2. It will be synergistic with existing centers and institutes and there are no similar programs and this does not result in duplication of efforts.

## **III. ENROLLMENT**

Since the Clemson University Center for Workforce Development (CUCWD) will not serve as a degree-granting academic unit, there are no admissions criteria or target enrollment figures. For this reason, the Projected Total Enrollment and Estimated New Enrollment tables have been omitted from this proposal. The students conducting research on sponsored programs that support CUCWD will be enrolled in degree-granting academic units at Clemson University. The academic departments in which the CUCWD affiliated faculty reside will be responsible for the administration of the student's programs and degree requirements. Research funds generated by Center faculty will provide for both thesis and non-thesis support (i.e., stipends, hourly salaries, etc.) for the students.

## **IV. CURRICULUM**

The Clemson University Center for Workforce Development (CUCWD) will neither offer courses nor administer a degree-granting program. Affiliated faculty will maintain their curriculum related duties within their home academic departments.

## V. FACULTY

Initially, the Clemson University Center for Workforce Development (CUCWD) faculty will be constituted of those 7 Clemson University faculty, 3 Deans of Technology from Technical Colleges and 9 faculty at engineering technology programs in the partner technical colleges, listed in Table I. All participating faculty will hold primary appointments in existing academic units. A faculty member with the title of Senior Fellow must fund Center projects through a sponsored research grant or contract to participate in the research program of the Center. New faculty will be strategically added to support the CUCWD mission. At present, Dr. Anand K. Gramopadhye at the Department of Industrial Engineering will continue to serve as Director.

**Table I.**

<b>List Staff by Rank (e.g. Professor #1, Professor #2, Associate Professor #1, etc)</b>	<b>Highest Degree Earned</b>	<b>Field of Study</b>	<b>Teaching in Field (Yes/No)</b>
Professor #1	PhD	Industrial Engineering	Yes
Professor #2	PhD	Mechanical Engineering	Yes
Professor #3	PhD	Computer Science	Yes
Professor #4	PhD	Automotive Engineering	Yes
Associate Professor #1	PhD	Industrial Engineering	Yes
Assistant Professor #1	PhD	Computer Science	Yes
Assistant Professor #1	PhD	Engineering Education	Yes
Executive Director	M.Ed	Education	No
Dean of Technology Greenville Technical College	PhD	Engineering Technology	No
Dean of Technology Florence-Darlington Technical College	PhD	Engineering Technology	No
Dean of Technology Trident Technical College	PhD	Engineering Technology	No
Greenville Technical College Faculty #1	M.Ed.	Engineering Technology	No
Greenville Technical College Faculty #2	M.Ed.	Engineering Technology	No
Greenville Technical College Faculty #3	M.Ed.	Engineering Technology	No
Florence-Darlington Technical College Faculty #1	M.Ed.	Engineering Technology	No
Florence-Darlington Technical College Faculty #2	M.Ed.	Engineering Technology	No
Florence-Darlington Technical College Faculty #3	M.Ed.	Engineering Technology	No
Trident Technical College	M.Ed.	Engineering Technology	No

Faculty #1			
Trident Technical College Faculty #2	M.Ed.	Engineering Technology	No
Trident Technical College Faculty #3	M.Ed.	Engineering Technology	No

The initial appointment of the Director will be at most for one-half FTE on a calendar year basis, where one Full-Time Equivalent is defined by Clemson University as 12 credit hours. Funds for the release time and summer salary of the Director and associated faculty will be derived either from the home academic department or through overhead that is returned on grant or contract research generated by the Center's faculty. Table I above details the rank and academic qualifications of each faculty member who will be involved in CUCWD (either presently or anticipated in the near future). Table II, shown below, substantiates expected Center support for personnel.

**Table II.**

<b>UNIT ADMINISTRATION/FACULTY/STAFF SUPPORT</b>						
<b>YEAR</b>	<b>NEW</b>		<b>EXISTING</b>		<b>TOTAL</b>	
	Headcount	FTE	Headcount	FTE	Headcount	FTE
<b>Administration</b>						
2011 – 12	0	0	1	0.2	1	0.2
2012 – 13	0	0	1	0.2	1	0.2
2013 – 14	1	0.2	2	0.4	2	0.4
2014 – 15	0	0	2	0.4	2	0.4
2015 – 16	0	0	2	0.4	2	0.4
<b>Faculty</b>						
2011 – 12	0	0	7	0.2	7	0.2
2012 – 13	0	0	7	0.2	7	0.2
2013 – 14	1	0	8	0.2	8	0.2
2014 – 15	1	0	9	0.2	9	0.2
2015 – 16	1	0	10	0.2	10	0.2
<b>Staff</b>						
2011 – 12	0	0	1	1	1	1
2012 – 13	0	0	1	1	1	1
2013 – 14	1	1	1	1	2	2
2014 – 15	0	0	2	2	2	2
2015 – 16	1	1	2	2	3	3

## **VI. PHYSICAL PLANT**

Space for the Clemson University Center for Workforce Development (CUCWD) personnel and infrastructure (including equipment purchased under sponsored programs) will be housed in either

space allocated to the individual faculty member by their respective academic departments. CUCWD will have three satellite offices such that it serves the geographically dispersed aviation and automotive industry – one at CUICAR in Upstate Greenville, another at Florence Darlington Technical College serving the Pee Dee and Midlands area, and at the Clemson University Restoration Institute in North Charleston serving the low country area (see Figure 3).

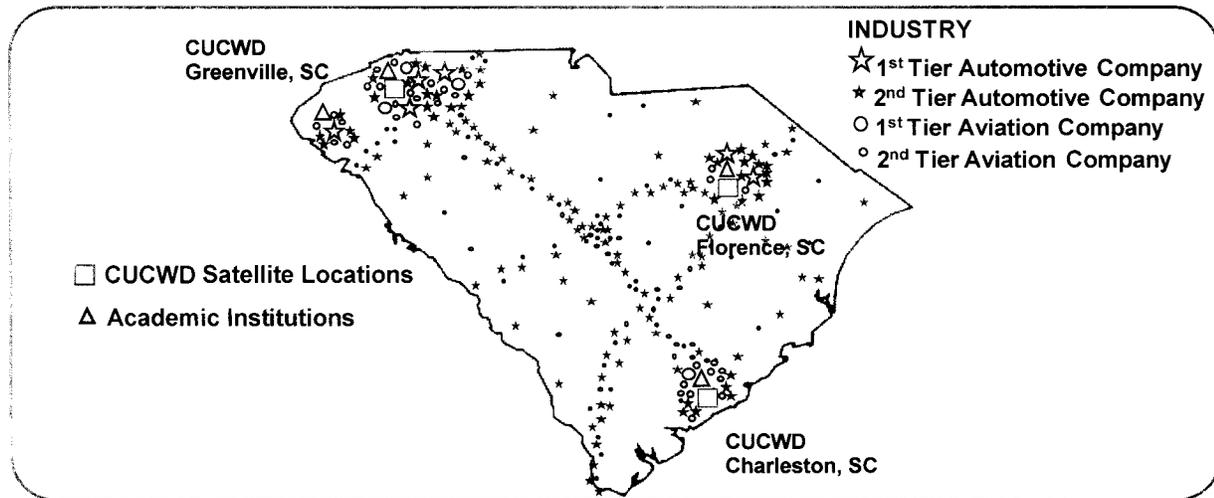


Figure 3. CUCWD locations

## VII. EQUIPMENT

The Clemson University Center for Workforce Development’s (CUCWD) equipment will be purchased through National Science Foundation (NSF) and Department of Labor (DOL) funds. Center supported equipment will be available to nonparticipating faculty, departments, and organizations for a fee, set at the University level, that reflects the costs of operation, maintenance, and upgrade. Major equipment required for this initiative includes tissue culture, histological, and rapid prototyping equipment.

## VIII. LIBRARY RESOURCES

The library resources already existing on campus will be sufficient for the operation of the Center and its projects.

## IX. ACCREDITATION, APPROVAL, LICENSURE, OR CERTIFICATION

Not applicable. However, the Clemson University Center for Workforce Development (CUCWD) will be evaluated through several existing procedures:

- (1) The individual affiliated faculty are evaluated yearly through Clemson’s Faculty Activity System (FAS) by their respective Departmental Chairs and Deans. In addition, untenured faculty undergo yearly review and reappointment and tenured faculty undergo periodic post-tenure review to ensure continued productivity and alignment with Departmental, College, and university missions and goals.
- (2) CUCWD, as a research organization, will be evaluated through the National Science Foundation (NSF) Advanced Technological Education’s (ATE) approved external evaluator

and the National Visiting Committee (NVC) Team. Similarly, an approved external evaluator has been appointed for the Department of Labor (DOL) Trade Adjustment Assistance Community College and Career Training (TAACCCT) grant.

- (3) Further metrics used to gauge the productivity of CUCWD include: **scholarship** (publications, presentations, grants, students supported and graduated funded through Center projects), **peer-recognition** (national/international awards, invited lectures/presentations, organizational involvement in conferences/workshops, professional society leadership roles), **technology transfer** (impact and use of educational material development by CUCWD by partners and beyond, patents, licenses, and start-up companies), and enrollment of K-12 students and teachers, 2-year and 4-year faculty in CUCWD organized workshops and symposia.

## X. ESTIMATED COST

The Clemson University Center for Workforce Development (CUCWD) research will be self sustaining through research grants, contract research services, and indirect funds generated on sponsored projects. As noted above, substantial funding has been realized and is expected to continue with expansion expected as the new staff and faculty are hired. CUCWD will process all fiscal operations through the standard College of Engineering and Science channels under the direction of the Director. Prospective faculty will indicate their desire to conduct projects through the Center by written application to the Director. A detailed sustainability plan has been developed beyond the original federal funding cycle. Clemson University is committed to and capable of both managing and sustaining CUCWD as demonstrated by the institution's successful work with two currently-funded NSF centers [Industry University Cooperative Research Center and Engineering Research Center]. Participating technical colleges using the E-learning modules will generate revenues through tuition, portions of which will be made available to the Center for future offerings. The business plan will outline new revenue sources to support the long term sustainability of the Center. These revenue sources include but not are limited to:

- Industrial consulting services – for workforce retraining and certification for companies;
- A<sup>2</sup> Job Networks – electronic job placement and tracking;
- Technology Transfer projects in support of technician education for other technical colleges, industry and professional technical training groups;
- Extending E-Learning to other domains beyond (e.g. capital projects, electrical utilities, etc).
- Develop and deliver international E-Learning opportunities to support technical education for multi-lingual workforce and multi-national companies.

The Center will also continue to seek funding opportunities from appropriate state, federal and industry funding sources that support its core mission.

**Table III**

<b>ESTIMATED COSTS BY YEAR</b>						
<b>CATEGORY</b>	<b>1<sup>st</sup> 2004-2005</b>	<b>2<sup>nd</sup> 2005-2006</b>	<b>3<sup>rd</sup> 2006-2007</b>	<b>4<sup>th</sup> 2007-2008</b>	<b>5<sup>th</sup> 2008-2009</b>	<b>TOTALS</b>
Program Administration	\$37,500	\$37,500	\$37,500	\$37,500	\$37,500	\$187,500
Faculty Salaries	\$140,000	\$140,000	\$210,000	\$300,000	\$390,000	\$1,180,000
Research Assistants	\$40,000	\$80,000	\$120,000	\$120,000	\$120,000	\$480,000
Graduate Assistants	\$60,000	\$80,000	\$80,000	\$80,000	\$80,000	\$380,000
Clerical/Support Personnel	\$20,000	\$30,000	\$60,000	\$60,000	\$60,000	\$230,000
Supplies and Materials	\$10,000	\$15,000	\$15,000	\$17,500	\$17,500	\$75,000
Library Resources	\$7,500	\$8,500	\$9,500	\$10,500	\$11,500	\$47,500
Equipment	\$50,000	\$100,000	\$25,000	\$30,000	\$20,000	\$225,000
Furniture	\$12,000	\$15,000	\$10,000	\$10,000	\$5,000	\$52,000
Facilities	\$0	\$0	\$0	\$0	\$0	\$0
Advisory Board	\$15,000	\$25,000	\$25,000	\$30,000	\$30,000	\$125,000
Travel/Visiting Scholars	\$20,000	\$30,000	\$35,000	\$40,000	\$45,000	\$170,000
Promotion	\$15,000	\$25,000	\$35,000	\$40,000	\$45,000	\$160,000
Prof. Memberships	\$5,000	\$10,000	\$12,500	\$15,000	\$17,500	\$60,000
<b>TOTALS</b>	<b>\$432,000</b>	<b>\$596,000</b>	<b>\$674,500</b>	<b>\$790,500</b>	<b>\$879,000</b>	<b>\$3,372,000</b>
<b>SOURCES OF FINANCING BY YEAR</b>						
Estimated FTE Revenue Generated from the State						
Tuition Funding (New students only)						
Other State Funding (Legislative Appropriations)						
Reallocation of Existing Funds						
Federal Funding	\$435,000	\$599,000	\$675,000	\$791,000	\$880,000	\$3,380,000
Other Funding*						
<b>TOTALS</b>	<b>\$435,000</b>	<b>\$599,000</b>	<b>\$675,000</b>	<b>\$791,000</b>	<b>\$880,000</b>	<b>\$3,380,000</b>

**Basis of New Cost Estimates:**

Program Administration: Academic year costs will be handled by an existing faculty member, who is the Director of CUCWD. The identified costs are for summer pay for CUCWD Program Director administrative costs.

Faculty Salaries: Salaries in this line item are for full-time summer salaries for the CUCWD, as well as 2-year college faculty.

Graduate Assistants: Graduate assistants will be apportioned to participating faculty during the academic year from the existing differential tuition for CUCWD.

Clerical/Support Personnel: The program will support 1 FTE for an administrative assistant for office operations, starting in year 1 and additional staff in year 3.

Supplies and Materials: For program operations.

Equipment: For both administrative support and new faculty.

Library Resources: To maintain a quality library and related data information for research.

Furniture: For administrative support, new faculty and research staff, and graduate students.

Advisory Board: To cover travel and related expenses for Advisory Board members.

Travel: For faculty and research staff to various professional and academic conferences and regional/national professional meetings; for pursuing grants and funding; for attracting visiting scholars and professionals for lectures, class participation, and research..

Promotional Materials: For related promotional costs including travel web page, advertising and promotion, outreach endeavors, posters and brochures, and other related costs.

Professional Memberships: For faculty and research associates to various professional and academic organizations.

### **Basis of Revenue Estimates:**

Estimated FTE Revenue Generated from the State: N/A

Tuition Funding (new students): N/A

Reallocation of Existing Funds: N/A

Federal Funding: Research grants have been awarded to CUCWD through the National Science Foundation (NSF) Advanced Technological Education (ATE) [\$2.4 M] program and the Department of Labor (DOL) Trade Adjustment Assistance Community College and Career Training (TAACCCT) [\$1 M] grants.

Other Funding: N/A

## **XI. ADMINISTRATIVE STRUCTURE**

The Clemson University Center for Workforce Development (CUCWD) will process all fiscal operations through the standard Departmental channels under the direction of the Center Director or grant principal investigators. Prospective faculty will indicate their desire to conduct projects through the Center by written application or sponsored research proposal to the Director.

<b>Institutional Approval</b>	<b>Date Approved</b>
Dean, College of Engineering and Science	<i>August, 2011</i>
Academic Council	<i>September, 2011</i>
Administrative Council	<i>September, 2011</i>
Doris R. Helms <i>Provost and Vice President for Academic Affairs</i>	<i>September, 2011</i>
James F. Barker <i>President</i>	<i>October, 2011</i>
Clemson University Board of Trustees	<i>October, 2011</i>