Submitted by: Vehicle Management & Parking Services

At the University of South Carolina (USC), we recognize that there are limits to the world's resources. To invest and ensure in the quality of life for our future generations, USC seeks to become a leader in environmental stewardship and sustainability by working with students, faculty, and staff to support local farmers, waste reduction, recycling, and water and energy conservation. With an initial focus on fuel cell technology (FCT), we are committed to conserving resources and reducing the impact our services and activities create on the environment. Environmental stewardship and sustainability requires us to be more creative and responsible in our thinking and problem solving. The inherent nature of a sustainability culture requires us to think and solve problems in an integrated, systematic approach. This concept requires us to begin to think about and solve problems through a systematic approach to learning. This approach is made up of three major components: team teaching, team learning (life skills included), and seamless disciplinary research that meets the needs of all students, faculty, and staff members at USC. The University has earned high profile in its current research on sustainable fuels. Some of the Fuel Cell Technologies include the Hydrogen Hybrid Fuel Cell Bus, Fuel Cell Light Rail Technology studies, and the Fuel Cell Score Board. These technologies not only strengthen USC's capabilities to promote current learning in students but also serve as a strong catalyst for university wide changes in the support of Fuel Cell Technology initiatives.

USC has an agreement with the Federal Transportation Administration (FTA) to demonstrate and collect data on a Hydrogen Hybrid Fuel Cell Bus (H2FCB). The H2FCB is currently the only one of its kind in the United States. The FTA plans to demonstrate the bus and its technology in three states. Columbia, South Carolina, has been designated as the first demonstration city.

USC is in a unique position to have such a valuable resource on its campus at this time. With the demonstration of the H2FCB, USC can build a quality enhancement plan that ties in with FCT and life learning skills on campus which are supported by an engaging curriculum, community interaction and private/public support. During the H2FCB demonstration, the University has an opportunity to garner support to further the uses of FCT. Fuel cell light rail initiatives should be explored to create and establish the Innovista as the hub for fuel cell research and applications. The University should build on the resources that currently exist in the Innovista to create a community conducive for learning. With this recognition, an environment that promotes research, scholarships and creative achievements will be shaped. Though these components will be exemplified across campus, they will be authenticated in the heart of the Innovista. This authentication will, in turn, create collaboration amongst students, faculty, and staff. Outcomes will result in research and working environments which will ultimately enhance student learning. Three major goals will enhance student learning through fuel cell technology initiatives.

1. **Promote a deep learning approach to education which will produce a better problem solver.** The FCT will support and sustain student learning through a deep learning approach. This technology will allow students to extract meaning and understanding from course materials and experiences to help solve multiple problems regarding the bus prototype. There is a wide range of interconnectedness among the environment, social, and economic issues regarding the bus. This type of interdisciplinary thinking allows deep learning to play a major role in the context of sustainability education. Our intent is to gather students from multiple disciplines and then collaborate as a university to solve problems associated with the application of FCT. This collaboration among students of different disciplines encourages students to think and solve problems outside their domain. Their ability to apply varied levels of expertise will be instrumental in solving problems now and far into the future. We are presently meeting this goal by demonstrating the application of FCT to several classrooms, field studies, and even football games. Presently, a graduate student in the Department of Chemical Engineering is collaborating with a faculty member from the School of Journalism and Mass Communications, and an undergraduate student from the School of Graphic Design in providing information about FCT to campus and visiting students.

2. **Create a more student centered environment that fosters student success.** The issues today's college students are being asked to solve are unprecedented in terms of complexity and urgency. Students require both a firm grasp of fundamental principles and a more holistic approach to learning that often extend outside their chosen majors. As a university, we must educate our students through a wider frame of reference and provide diversified skills to meet future challenges. This approach requires educators and administrators to seek and to provide new methods in teaching. Additionally, technological changes, global networks, and sustainability issues have put pressure on universities to help train and prepare tomorrow's problem solvers. FCT can also serve as a tool to prepare tomorrow's leaders. Presently, several faculty and staff members are involved in gathering data while the hydrogen hybrid bus is on campus. Subsequently, this interaction provides research opportunities for undergraduate and graduate students. As the campus becomes more aware of the FCT presence, there will be more opportunities for departments on campus to benefit from and for students to engage in active learning. In addition to engineering, science, and math departments, the social sciences -- such as economics, political science, public policy, sociology, and psychology departments -- will also benefit. "It is often the social aspects of an issue
that present the greatest barriers to implementing a change that puts society on a more sustainable trajectory.1 Typical questions that will enhance student involvement and expand interdisciplinary collaborations are as follows: "How can we reduce the present cost of a 3 million dollar bus and make it more affordable without reducing quality?" "What are the social benefits of possessing the H2FCB bus"? "Are there any reasons that society may reject this type of vehicle"? Answers to these questions will broaden social and technical science FCT platforms that stretch far and beyond one single domain. This type of collaborative thinking builds a versatile student body that will make significant contributions to sustainability.

3. **Encourage faculty and staff to embrace student learning communities as a primary teaching methodology.** As faculty and staff become more aware of FCT and possible applications, the campus will be challenged by problems surfacing from this integration, thus producing new teaching methods. USC must commit itself to embrace bold changes that will promote new learning experiences. "In lieu of the traditional linear approach to learning, FCT promotes a networked model. This model allows for all components, (technical, contextual, lab and design), to be integrated into a more enhanced learning experience for both student and educator. The learning trajectory thus shifts from a linear alignment to a spiraling one."2 This learning style promotes a more adaptive student in an increasingly complex world. By using FCT applications on campus, students will be 4 presented with open-ended investigations. These investigations, sometimes located in imperfect environments, will teach students to solve and deal with uncertainties with more than just one approach or answer. They will also allow students to learn and understand how courses and structures in different environments are connected.

As an institution, USC is fostering a more holistic student who will solve problems and devise new questions in the process. We are, in essence, educating a marketable student who will be better prepared to enter a workforce. This student will have developed workforce skills that require creativity and innovation in taking on complex societal challenges. FCT applications exemplified throughout the Innovista will challenge our students to take different approaches to conundrums that will inevitably face them tomorrow.

**References**

1. Savage, P. "What Does It Mean To Be Green?" [www.aiche.org/cep](http://www.aiche.org/cep) September 2009 p.34

2. Savage, P. "What Does It Mean To Be Green?" [www.aiche.org/cep](http://www.aiche.org/cep) September 2009 p.60