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EngenuitySC Commercialization and Entrepreneurial Training Project

Final Performance Report

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1. EXECUTIVE SUMMARY

A team led by EngenuitySC has performed education and outreach for DOE EERE under contract DE-EE000328 on development of advanced energy markets that will enable wider use of clean energy technologies. This report details the efforts that have made significant advances to improve the market place through education, outreach, and increased communications between industry members. The project resulted in two self-funded industry clusters known as the Fuel Cell Collaborative and NuHub.

1.1 Introduction

South Carolina is investing in new efforts to create the foundations of a knowledge economy to diversify its current primary economic dependence on manufacturing, agriculture and tourism. EngenuitySC is leading efforts to establish Columbia as a center of alternative energy and clean technology. Columbia and the Midlands have significant resources to develop into an area where the hydrogen economy and the nuclear power industry can create a significant number of jobs. This project has seeded industry clusters that are actively promoting and growing the expertise in the region in these technologies. These clusters have a mission to become self-funded collaborations that enhance the competitiveness of the companies and the workforce in the energy market.

1.2 Background and Objectives

South Carolina has historically had a leadership role in the nuclear industry in both research and deployment with over 50% of the grid power provided by nuclear plants and nuclear fuel fabricators located in the area. The state has also been leaders in the development of hydrogen energy technologies and energy storage. The University of South Carolina leads in the area of hydrogen and fuel cell technology where researchers in chemical engineering, chemistry, mechanical engineering, electrical engineering, and many other disciplines are researching and developing various aspects of the technologies.

Within the next 15 years, more than $40 billion of capital investment in nuclear power generation will be deployed within a 100 mile radius of Columbia, SC. However, less than 2% of the total market for nuclear technology procurement will happen in South Carolina. This presents a significant opportunity for our region to expand nuclear and other clean technology commercial activity in the region. Also, despite the hydrogen and fuel cell expertise in Columbia, there have been relatively few jobs created and the performance of South Carolina companies winning competitive research awards such as SBIRs has been below average.

This project implemented cluster formation and growth strategies recommended to the Midlands region of South Carolina based on the recommendations of previous studies of Michael Porter regarding existing strengths in the state. The outcomes of this work will be the formation of clusters to address the needs of the hydrogen energy and nuclear energy industries in the Midlands and develop a climate where they can grow and create more jobs focused on these technologies. This work will also help convert investments in research at USC by NSF, DOE, and other agencies to a center of activity that better addresses the needs of the fuel cell industry.

1.3 Results

This project has focused on building and strengthening the leading clean energy clusters in South Carolina: nuclear energy and fuel cell technologies.

For the nuclear industry, a new cluster was developed that is now known as NuHub. This cluster has already engaged over 25 nuclear industry leaders or suppliers, four public sector partners, six community economic development foundations, and nearly ten academic partners in a 175 mile radius between Augusta, Georgia and Charlotte, North Carolina. Our outreach has touched over 2,000 stakeholders through the website alone, not including the public audiences and members of the business community reached through news stories and releases that were distributed to over 620 print and online publications. NuHub has established a formal leadership

structure, developed subcommittees to focus on industry issues, instituted educational programs for the workforce, and created an industry funding structure that will sustain the industry cluster and mission.

NuHub has participated in a wide-variety of community building and outreach activities since its formation under this grant. In the two years since its creation in 2010, we have initiated efforts focused in four main areas that correlate with the four NuHub subcommittees including: innovation, workforce development, industry engagement, and marketing and communications. NuHub successfully raised over $160,000 in both public and private funding, which has supported work to grow the cluster and engage partners including NuScale, Fluor, and Holtec International for research about deployment of advanced small modular reactor (SMR) technologies.

The workforce training efforts from NuHub have focused on assisting existing industry to fill positions needed to construct and operate new nuclear plants being built at the VC Summer plant in Jenkinsville, SC and at Plant Votgle in Augusta, Georgia – both of whom are constructing the first nuclear reactors (Westinghouse AP 1000 units), to be built in over 30 years. This includes a partnership with Midlands Technical College to train reactor operators and the development of training facilities to support workforce development activities. It is anticipated that approximately 70 students a year will be trained through these programs in the next five years, and it will be expanded to meet new industry needs.

A rebranding, expansion, and refocusing of the Fuel Cell Collaborative has been the vehicle for cluster growth in hydrogen and fuel cell technologies. The Fuel Cell Collaborative was expanded to include workforce education through Midlands Technical College that will compliment advanced degree programs at the University of South Carolina. This focus on workforce and advancing technical education was suggested by industry members such as Trulite and Logan Energy Carolinas. Both of these companies announced plans to locate new facilities at Midlands Technical College based on the access to trained technicians.

The Fuel Cell Challenge launched Round V (FCC V) as with a focus on meeting fuel cell industry research needs and developing entrepreneurship in hydrogen and fuel cell technology in the Midlands. FCC V was structured to mirror the RFI / RFP process followed by most federal agencies together with contract negotiations and awarding that follows practices common in the federal government. This was intended to give researchers, students, and companies experience in how competitive research projects are awarded. The development of business plans and other criteria that are important in seeking private funding was emphasized.

FCC V was launched in August 2012 with nine challenge topic submissions from industry with both national and international submissions. Challenge submissions were assembled by teams of researchers and students with eight teams totaling 25 participants throughout USC. There were three submissions for the Innovation Challenge to help develop a prototype or investigate and prove the concept for a novel technology, and five submissions for the Industry Challenge to solve real world technical or business problems. In the end, one Innovation Challenge and two Industry Challenges were awarded a total of $75,000 in funding put up by Fuel Cell Collaborative members. These projects are ongoing and will be completed by May 2013. The Fuel Cell Collaborative outreach and cluster growth activities included the coordination of a fuel cell lift truck workshop and an industry advisory board meeting.

2. FINAL PERFORMANCE SUMMARY

PHASE 1: CLEAN ENERGY CLUSTER DEVELOPMENT

Task 1.0 Stakeholder Engagement

Subtask 1.1 Establish Project Stakeholders

Narrative:

Fuel Cells: The project team engaged public and private sector partners to determine their desire and ability to serve on a cluster-oriented industry advisory group. In addition, the project team held several strategic planning activities to evaluate the direction our existing hydrogen and fuel cell programs should take. Progress on this task was made and we now have a list of key industry stakeholders that we will officially invite to join the fuel cell cluster in the next quarter. The project team has completed stakeholder analysis and recruiting of all public and economic development partners.

Nuclear Energy: The group continued to strengthen the collaboration, dialogue, and information sharing for all partners within the regional project. In addition, the project team explored adding additional stakeholders from other regions in the Midlands of SC that have assets and opportunities in the nuclear space. The team also began to establish formal dialogues with stakeholders in Aiken and Charlotte related to a Carolinas Nuclear Cluster that has recently been launched. The group completed a teaming agreement with the Savannah River Solutions Community Reuse Organization to strengthen the collaboration, dialogue, and information sharing for all partners within the regional project.

Key Outcomes:

Fuel Cells:

- The project team developed a plan to establish a Fuel Cell industry advisory group and to determine the key priorities for the fuel cell effort in the region.
- The project team attended the Fuel Cell and Hydrogen Energy Association's annual conferences and Fuel Cell Seminars and was involved in strategic planning relative to strengthening the U.S. hydrogen and fuel cell industry.
- The project team held several stakeholder engagement meetings to provide program updates and seek direction for initiatives.
- The project team met with U.S. General Fuel Cell, Logan Energy, Trulite, Greenway Energy, and several other companies to gauge their interest in participating in an industry/university collaboration to advance fuel cell activities in the Columbia region. The response was favorable. Table 1 gives a partial list of organizations engaged by the Fuel Cell Collaborative.

Table 1. A partial list of local organizations engaged by the Fuel Cell Collaborative

Industry	Education	End Users	Non-Profits	Government
Trulite, Inc. Weylchem Sustainable Materials, LLC Palmetto Fuel Cell Analysis and Design, LLC Douglas Fluid Systems, LLC Columbia Fluid Systems, LLC Logan Energy Carolinas, LLC Greenway Energy, LLC	USC Midlands Tech	USC CMRTA City of Columbia	SCRA EngenuitySC South Carolina Hydrogen & Fuel Cell Alliance	City of Columbia SC Dept. of Commerce

Nuclear Energy:

- Additional stakeholders were identified from the eight county region of the midlands of South Carolina and invited to join the working group.
- The Columbia team established a dialogue with Savannah River National Labs to explore creating a multi-county collaborative partnership to advance nuclear energy and innovation in South Carolina.
- EngenuitySC formally joined the Carolina's Nuclear Cluster, a two state effort to advance the opportunities associated with nuclear energy in North and South Carolina.
- Two collaborative projects were initiated as a way to form cross-regional partnerships.
- Table 2 gives a partial list of organizations engaged by NuHub.

Table 2. A partial list of local organizations engaged by NuHub

Industry Leaders
SCANA/SCE&G
Savannah River National Laboratory
Santee Cooper
Westinghouse Electric Company

Suppliers/Contractors/Service Providers
Alpha Manufacturing Company
AvanTech Inc
Carolina Fabricators
Carolina Systems Inc.
Energy Solutions
Garlock Helicoflex
Global Pundits
Moto Corporation
RCS Corporation
REVOIT LLC
Tetra Tech
URS Corporation
Weld Spect Technologies

Public Sector Partners:
City of Columbia
Fairfield County
Richland County
SC Department of Commerce

Education Resources/Others:
Allen University
Benedict College
CentralSC Alliance
Claflin University
EngenuitySC
Greater Columbia Chamber of Commerce
Midlands Technical College
Midstate Chamber Coalition
Navigating from Good to Great Foundation
New Carolina
SCRA
SC State University
SC Technical College System
University of South Carolina

Challenges for the Clusters and Steps to Address Them:

Fuel Cells:

- The challenge still remains to establish a strong advisory group because of the lack of company activity in the region. There are only a handful of companies, and most of which are small technology startups. Our colleagues at the statewide SC Hydrogen and Fuel Cell Alliance are struggling with the same challenge due to the nascent nature of our industry activities in SC. It is anticipated that completion of supply chain mapping will assist all organizations in South Carolina to better engage stakeholders.

Nuclear Energy:

- The nuclear cluster underwent supply chain mapping during the project that helped identify many local stakeholders in the industry. Determining the right communication channel with other regional groups was challenging due to disparate interests within the group. The differing interests of the stakeholders are addressed through the formation of committees focused on different topics in the nuclear industry.

NuHub also provides opportunity for networking during which groups of companies with similar problems have a chance to discuss potential solutions.

Subtask 1.2 - Establish Leadership & Management Team

Narrative:

Fuel Cells: EngenuitySC continued to develop the formal collaboration structure for the Fuel Cell Collaborative. This focused on continued engagement with existing partners SCRA, University of South Carolina and the City of Columbia. In addition, EngenuitySC explored additional formal partners at Midlands Technical College and the Columbia Chamber of Commerce. Agreements were finalized with Midlands Technical College to join the collaborative and they participated in regular meetings during the grant period. The full management team for the Fuel Cell Collaborative is listed in Appendix B.

Nuclear Energy: EngenuitySC continued to develop the formal collaboration structure for the new initiative and continued engagement of key stakeholders to determine who and for what purpose they would be involved. The group also engaged in several focus groups to explore what leadership and management positions need to be established to fulfill the outcomes of the grant. EngenuitySC, in partnership with the Greater Columbia Chamber of Commerce and the City of Columbia, established a team to reach out to local industry suppliers to better engage local businesses and get them involved in the initiative. EngenuitySC established a Marketing/Communications Subcommittee to guide the development of communications and marketing materials that highlight the nuclear energy opportunities in the region. Additional stakeholders were added to the Workforce Development subcommittee, SMR Development subcommittee, and Industry Engagement subcommittee. The executive committee for Nub is listed in Table 3. The full management team for NuHub is listed in Appendix B.

Table 3. Executive Committee for NuHub

Executive Committee

Co-Chairs: Sonny White - President, Midlands Technical College
Steve Byrne - Chief Operating Officer, SCE&G; Executive Vice President, SCANA

SMR Subcommittee
Chair: Charles T. Speth - Managing Attorney at Ogletree, Deakins, Nash, Smoak & Stewart, PC

Communication Subcommittee
Chair: Anthony Ambler - Dean of the College of Engineering & Computing, University of South Carolina

Industry Engagement Subcommittee
Co-Chairs: Don Herriott - Director, Innovista, University of South Carolina
Ann Marie Stieritz - Director of Business Solutions, Innovista, University of South Carolina

Workforce Development Subcommittee
Chair: Sonny White - President, Midlands Technical College

Education & Workforce: EngenuitySC and YESCarolina established a YESCarolina Midlands Chapter to assist the management team with the establishment of a regional entrepreneurship education and training programs to expand the pipeline of future (K-12) entrepreneurs in our community.

Key Outcomes:
Fuel Cells:

- Greg Clark with SCRA/SC Launch was brought onto the Fuel Cell team to support industry engagement and new company formation.
- Katherine Robinson (EngenuitySC) was assigned to the task of project development and support to manage fuel cell-related project requests that the collaborative has been receiving.
- Midlands Technical College was added to the Fuel Cell Collaborative with

Nuclear Energy:

- Three additional focus groups/committees were identified as necessary to accomplish the project objectives:
    - K-12 Focus group: This group will work to influence education leaders who can influence many students in their higher education and career choices.
    - Supplier Subcommittee: This group will work to recruit small businesses in the region into a nuclear supplier certification program
    - Marketing/Communications Subcommittee: This group will work to develop communications and marketing materials that highlight the nuclear energy opportunities in the midlands

Subtask 1.3 Identify Roles and Responsibilities

Narrative:
Fuel Cells: Early in the project, roles and responsibilities were established with the current stakeholders to identify which organizations would be responsible for the deliverables associated with the project. The fuel project team focused on the four key areas of support under this grant: entrepreneurship capacity building, workforce development, innovation and new business formation, and industry engagement. Roles and responsibilities for each of these segments were identified and specific participants on the project were assigned to management roles. In addition, support roles within the cluster were provided by the EngenuitySC team, including: project management, administration, stakeholder communications, and financial management. The opportunity uncovered how to add additional partners (mentioned above) to bolster deficiencies in current activities (traditionally, industry engagement and new company formation). We believed these roles could be fulfilled through additional contributions by the Columbia Chamber (industry engagement) and Midlands Technical College (industry engagement and workforce development), and finalized the addition of Midlands Technical College during the project time period.

The project team focused on finalized roles and responsibilities with appointed stakeholders to identify which organizations would be responsible for the deliverables associated with the project. The project team also expanded roles and responsibilities into six areas of focus for economic development activities around fuel cells: research and development, entrepreneurship and commercialization, business retention and expansion, new industry engagement, environment and infrastructure, and marketing and communications. Roles and responsibilities for each of these segments were identified and specific participants on the project were assigned to management roles. Here is a list and brief description of each:

- Research Development: Expand the depth, breadth, and quality of hydrogen, fuel cell, and future fuels research taking place in the Greater Columbia region.

- Entrepreneurship & Commercialization: Identify, commercialize and nurture new products and businesses stemming from discoveries made in hydrogen and fuel cells.

- Business Retention & Expansion: Support the retention and expansion of the existing hydrogen and fuel cell industry in the region through increasing competitiveness.

- New Industry Engagement: Identify, engage, and recruit active private sector partners into the Columbia region for landing parties, collaborations, and investment.

- Environment & Infrastructure: Improve the environment to support hydrogen and fuel cell technology deployment through projects focused on growing demand for technology applications

- Marketing & Communications: Raise awareness for the Columbia region as a world class destination for hydrogen and fuel cell technologies to attract private sector partners, top fuel cell scientists, entrepreneurs and innovators to the Columbia region

Nuclear Energy: Once the Leadership and Management team were identified, more defined roles and responsibilities were defined for specific members of the Leadership Team and all members of the Management Team. An Executive Committee, composed of four members from the Leadership team, was formed to provide strategic vision, governance, and direction for the activities of the project. The Executive Committee was also given authority to establish and develop more fully the Leadership Team and Taskforce Team. The role of the Leadership Team was defined as participating in planning and providing guidance on overall strategic direction for the activities chosen. The role of the Taskforce Team was defined as serving on special project task force teams and subcommittees established to help move the activities forward undertaken by the project. In addition to identifying the roles and responsibilities of these groups, roles & responsibilities for each member of the management were determined and cover the areas of marketing/communications, grant management, project management, industry engagement, community engagement, and leadership development.

The organizations were identified which will have operational control over what program areas and evaluating what each project partner can provide in terms of capital, people, support, and facilities to keep the project sustainable after the grant period ends.

Key Outcomes:

Fuel Cells:

- The following key roles and responsibilities were established by the project team in order to slot members into appropriate positions:
    - Research – Supporting the growth of research in fuel cells at the University of SC
    - Commercialization – Supporting the creation of new fuel cell companies around research
    - Existing Industry – Supporting and growing the existing companies in fuel cells in the Columbia, SC region
    - New Industry Recruiting – Targeting, engaging, and attracting new fuel cell firms to the Columbia, SC region
    - Workforce Development – Addressing the needs of existing and potential fuel cell companies by developing the pipeline of technical talent required to grow an industry
    - Projects – Identifying, developing and supporting hydrogen and fuel cell projects that advance Columbia's reputation as world class destination for fuel cell innovation
    - Marketing & Communications – Engaging and connecting to a broad range of public and private sector partners through active communications and marketing activities

Nuclear Energy:

- Roles and responsibilities were identified for the Leadership Team, the Taskforce Team, and the Management Team
- The Taskforce Team was broken down into Subcommittees focused on the following four initiatives:
    - Innovation: This initiative is focused on identifying, launching, and nurturing the growth of nuclear-related high tech and alternative energy companies and attracting and increasing research

and development activity in the midstate. The current focus is on small modular nuclear reactor technology.
    - Workforce: This initiative is focused on developing programs to meet 100% of the nuclear workforce needs by establishing regional educational and workforce development programs focused on training today's clean energy workforce and growing the future clean energy workforce (K-12).
    - Industry Engagement: This initiative is focused on recruiting existing suppliers and fostering new suppliers into the nuclear supply chain as well as recruiting new and expanding existing nuclear companies in the region.
    - Communications: This initiative is focused on developing marketing materials and communications strategies to promote the regional nuclear assets and opportunities in the midstate.
- An Executive Committee was established to provide overall leadership and governance and includes a strong and balanced reputation from industry, academia and community:
    - Co-Chairs
        - Steve Byrne, SCANA
        - Sonny White, Midlands Technical College
    - Executive Committee (includes co-chairs)
        - Don Herriott, Innovista Partnerships
        - Don Goldbach, Westinghouse

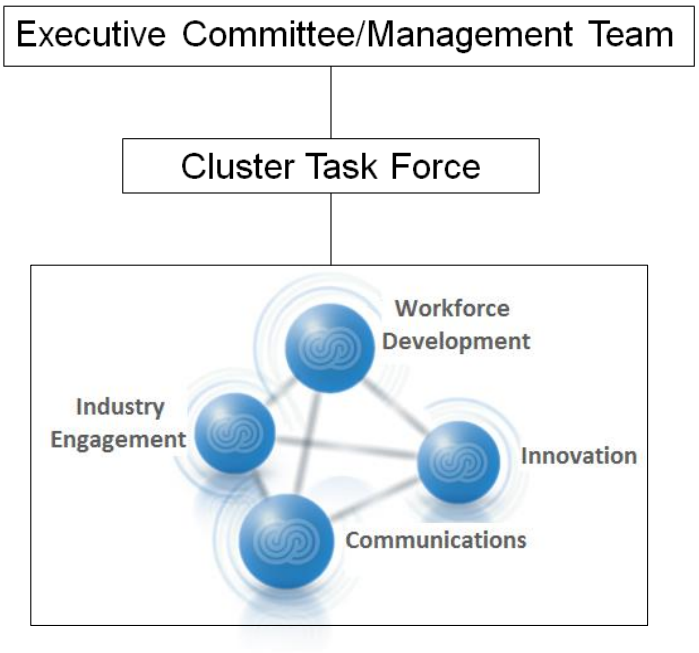
Subtask 1.4 Establish Organizational & Collaboration Structure

Narrative:
Fuel Cells: Discussions were held about growing the fuel cell collaborative organization to include new participants such as Midlands Tech, Columbia Chamber, and the private sector (through advisory board). The project team was focused on outlining what organizational and collaboration structures need to be put in place to maximize the outcome and sustainability of the Fuel Cell Collaborative. These structures included 1) Creating a chair position for the leadership team, 2) establishing working groups around priority focus areas (see above), 3) and developing the concept and purpose of the industry advisory group. Collaboration agreements between the original four parties were revised to include the fifth partner, Midlands Technical College.

Nuclear Energy: The newly formed Executive Committee took the first steps in establishing a formal collaboration agreement and organizational structure by developing a set of by-laws for the group in the form of an operation agreement between the nuclear stakeholder group and EngenuitySC. The operating agreement outlined the purpose and goals of the group; the roles of the Executive Committee, Leadership Team, Taskforce Team and Management Team; and the funding/budget approval process.

The project team discussed with project partners what the structure of the initiative should look like after the grant period that will allow it to continue. The stakeholders decided that a membership structure would be established to create an organizational structure and to support operations. Table 4 shows the organizational chart for NuHub that illustrates the interaction between the executive committee and the cluster task force.

Table 4. Organizational Chart for NuHub



Key Outcomes:

Fuel Cells:

- Educational interests in the Fuel Cell Collaborative were promoted by adding Midlands Technical College as a member.

Nuclear Energy:

- An Operating Agreement was put into place for the nuclear initiative

Task 2.0 Program Development

Subtask 2.1 Identification & Inventory of Target Programs

Narrative*:*
Clean Energy: Chernoff Newman developed a service agreement with EngenuitySC to create a brand for economic and workforce development efforts around clean energy in the Midlands. The agency was authorized to provide strategic direction, branding, communications, media and public relations services for the term of the grant period. EngenuitySC approved the service agreement. The key focus of their activity involved exploring what key assets relative to clean energy could and should be promoted in new marketing material for the project. Also, discussions were held on the best way to position both fuel cells and nuclear under the umbrella of clean energy.

Fuel Cells: The project team worked with collaborative partners to update an inventory of resources available in the Columbia, SC region to support the growth of the hydrogen and fuel cell economy. Existing assets were identified, but the project team focused on updating information and on identifying new assets that have come online. The inventory covered research activities, innovation infrastructure (incubators, accelerators, research facilities), commercialization resources (startup capital, proof of concept capital), and the deployment of projects in the Columbia, SC region. The project team also worked with the South Carolina Hydrogen and Fuel Cell Alliance to revisit the 20 year strategic plan for hydrogen and fuel cells in South Carolina. One portion of this project involves mapping the supply chain for fuel cells in South Carolina and identifying key assets on a statewide basis that can be used to advance the clean energy economy.

A report on the economic impact of hydrogen and fuel cell activities in the region is attached in the Appendix C to this report. The results of those findings had a tremendous impact on the activities of the Collaborative during the report period. Additionally, the USC-Columbia Fuel Cell Collaborative completed its FY2012 strategic action plan that details the specific areas of focus and program of work for the coming 12 months. This action plan is attached as supplemental information in this report and has been approved by the executive committee for the Fuel Cell Collaborative team. Specific areas of focus were highlighted in above mentioned section (Task 1.3).

- Research and Development: Supporting the growth of research in fuel cells at the University of SC
- Tech Transfer and Commercialization: Supporting the creation of new fuel cell companies around research generated at the University of South Carolina (USC, SCRA, and EngenuitySC)
- Existing Industry Outreach: Supporting and growing the existing companies in fuel cells in the Columbia, SC region (EngenuitySC, Columbia Chamber)
- New Industry Outreach: Targeting, engaging, and attracting new fuel cell firms to the Columbia, SC region (EngenuitySC, SCRA, USC)
- Workforce Development: Addressing the needs of existing and potential fuel cell companies by developing the pipeline of technical talent required to grow an industry (Midlands Technical College)
- Technology Deployment and Demonstration: Identifying, developing and supporting hydrogen and fuel cell projects that advance Columbia's reputation as world class destination for fuel cell innovation (EngenuitySC, SCRA)

The project team has identified key project opportunities for development. The following list represents the projects that were implemented in the second half of the grant. Some prioritization and streamlining of this project list may take place in order to match deliverables with available resources. Target/priority projects are highlighted in **bold**.

- Research and Development:
    - **Support the University of South Carolina's growth in research by establishing a university/industry collaboration event in the spring of 2012**.

    - Identify, evaluate, and develop a public/private fuel cell research and testing facility within the University of South Carolina
- Tech Transfer and Commercialization:
    - **Establish an innovation competition focused 100% on identifying, accelerating, and commercializing technologies being discovered at the University of South Carolina.**
    - Host an innovation showcase with the University of South Carolina to showcase breakthrough technologies, connect to industry partners, and increase tech transfer and industry collaborations.
- Existing Industry Outreach:
    - Establish an industry advisory board to help increase private sector involvement in our economic development activities.
    - **Establish a formal Business Retention and Expansion program in partnership with the Greater Columbia Chamber of Commerce and the City of Columbia.**
- New Industry Outreach:
    - Identify, evaluate, and target fuel cell companies where there is synergy between the University of South Carolina's research strengths and growth in the marketplace.
    - Identify and attend (2) major trade shows per year focused on the hydrogen and fuel cell industry.
- Education/Workforce Development:
    - Recruit students and companies into the Midlands Technical College Fuel Cell Technician training program.
    - **Host a fuel cell demonstration and public day to increase awareness and acceptance for fuel cell technology in partnership with the University of South Carolina and the private sector.**
    - Inventory and promote educational and workforce development programs in fuel cell-related programs at the University of South Carolina (i.e.: chemical engineering, mechanical, materials science) and help connect students with fuel cell companies).
- Technology Deployment and Demonstration:
    - Support the deployment and demonstration of a LoganEnergy backup power project at the Midlands Technical College Enterprise Campus.
    - Support the deployment of a LoganEnergy mobile fuel cell power project for market adoption in the Columbia, SC region.
    - **Identify and recruit a target distribution or warehouse location for a pilot fuel cell forklift demonstration project**
    - Identify an additional transportation application for the Columbia Hydrogen Fueling Station (bus, car, or alternative vehicle).

Nuclear Energy: The project team assembled to perform an inventory of nuclear assets in the Greater Columbia region has completed the task. The working database contains 89 organizations with ties to the nuclear industry that encompass that following sectors: education, city and county government, service providers, and nuclear industry members. Members of the project team also supported the region's first Supplier Certification Workshop which was hosted by the Carolinas Nuclear Cluster, an initiative of the South Carolina Council on Competitiveness. The team helped by recruiting small businesses to attend the event which attracted 43 individuals. The project team also helped connect the SC Department of Commerce existing business program to the supplier recruitment efforts of the Carolinas Nuclear Cluster.

The project team completed an initial inventory of nuclear assets in the Greater Columbia region. The project team analyzed the gaps and the growth areas to determine what new programs were needed. The following program focus areas were established to align with the project objectives and industry needs:

- Innovation: This initiative is focused on identifying, launching, and nurturing the growth of nuclear-related high tech and alternative energy companies and attracting and increasing research and development activity in the midlands. The current focus is on small modular reactor technology and a subcommittee has been formed to lead this effort.

- Workforce: This initiative is focused on developing programs to meet 100% of the nuclear workforce needs by establishing regional educational and workforce development programs focused on training today's clean energy workforce and growing the future clean energy workforce (K-12). Both a K-12 focused group and a college age and above focused group have been formed to lead this effort.
- Manufacturing/Supply Chain: This initiative is focused on recruiting existing suppliers and fostering new suppliers into the nuclear supply chain as well as recruiting new and expanding existing nuclear manufacturing in the region. A taskforce team has been formed to begin reaching out to local businesses.
- Industry Engagement: This initiative is focused on developing marketing materials and communications strategies to promote the regional nuclear assets and opportunities in the midlands. The program's goal is to recruit new, expand existing, and transition traditional companies to nuclear technology in the region. A working group will be formed in quarter 4 with development of a website.

The Manufacturing/Supply Chain initiative was rolled into the Industry Engagement initiative and a separate Communications initiative was launched to focus on development marketing materials and communications. The new Industry Engagement initiative is focused on recruitment, stakeholder outreach, business creation, and business retention to grow and enhance the supplier concentration in the region.

The Annual Plans that each committee developed this quarter are outlined below. Each committee will use the planning tool going forward to establish quarterly goals to ensure successful completion of the annual goals established.

SMR Subcommittee:
- Develop relationships with SMR vendors and stakeholders to assist with recruiting supply chain members
- Support the development of educational, professional, and R&D programs in the region
- Recruit and host at least 1 trade show focused on SMR technology and application

Workforce Subcommittee:
- Develop a workforce development strategy to expand training programs for the future and current workforce
- Pursue creation of an internationally recognized training center or program
- Build a collaboration of the regional two year technical schools and four year college programs

Industry Engagement Subcommittee:
- Connect companies to a regional supplier quality certification program
- Foster new business creation by reaching out to current industry members to assess needs and working with economic developers to promote the region
- Recruit and host 1-2 industry trade shows and conferences

Marketing/Communications Subcommittee:
- Assist with communications and outreach to key stakeholders and supporters
- Develop a NuHub website and quarterly newsletter to promote regional assets and opportunities
- Host 1 community outreach program to provide educational information to the public

Key Outcomes:
Clean Energy:
- Chernoff Newman, a marketing and public relations firm, has begun developing a Midlands Clean Energy regional brand, focused on fuel cells and nuclear energy.

Fuel Cells:
- A listing of all fuel cell projects was developed that demonstrated our investment and commitment to hydrogen and fuel cell technology in the region

- A listing of hydrogen and fuel cell research taking place at the University of South Carolina was developed and the team has identified more than 100 researchers, faculty, and staff supporting hydrogen and fuel cell research at the University

Nuclear Energy:

- EngenuitySC helped the Carolinas Nuclear Cluster host a regional Supplier Certification Workshop and helped connect the Carolinas Nuclear Cluster to stakeholders who can help recruit small businesses into the supply chain
- The inventory of nuclear assets in the Greater Columbia region was completed

Subtask 2.2 Establish Project Scope & Deliverables

Narrative*:*

Clean Energy: Chernoff submitted a project scope, proposed budget, set of deliverables with a timeline to develop a marketing and brand strategy for the clean energy program. Chernoff completed the brand and positioning development process for the nuclear initiative which is now called NuHub. Chernoff also began working on a printed marketing piece and marketing/PR plan for the clean energy initiative.

Fuel Cells: The team developed programs around the areas of focus mentioned earlier with specific emphasis on new company formation, existing industry support, new industry engagement, and workforce development. The industry engagement team identified several key private sector entities that were targets for collaborative projects. In addition, the team evaluated additional projects that could be put into place to spur innovation and commercialization within the research university.

The fuel cell collaborative focused on developing project concepts, plans, and a timeline for two key projects in this quarter. See appendix for detailed concepts for each program.

- The Fuel Cell Challenge 2012 – An industry driven innovation challenge that connects interdisciplinary student teams at the University of South Carolina to real companies to spur innovative approaches to solving actual challenges facing the industry. The goal is to spur new technologies and innovations that can be developed and deployed into the commercial market for economic impact.

- Fueled™ - Fueled is a business retention and expansion program, based on the Business In Motion program created by the City of Columbia in 2008. It is an effort to engage existing startups and technology firms in the fuel cell space to increase their competiveness by addressing common issues, opportunities and leveraging partnerships established through the Fuel Cell Collaborative.

Nuclear Energy: The SMR Subcommittee focused on recruiting SMR activity to the region. The subcommittee launched its first project in January of 2011 to develop a description document that demonstrated to SMR manufacturers, potential operators, and regulators that South Carolina offered a unique combination of resources to develop, manufacture, and service SMRs nationally and internationally. The team also helped coordinate a SMR Conference in Columbia April 19-20 that was hosted by Nuclear Energy Insider. The project team was composed of members from the Leadership, Taskforce, and Management teams had solid technical backgrounds in the industry and knowledge of the local community.

The Workforce Subcommittee focused on development programs to meet 100% of the nuclear workforce needs and established the following three focus areas: two year technical college programs, bachelors and masters programs, and K-12 outreach. The subcommittee launched its first deliverable for Midlands Technical College (MTC) to pursue regional designation from the National Science Foundation (NSF) as a Center of Excellence in Nuclear Education. NSF notified MTC that another community college was competing on equal footing for the designation, so MTC and the other college decided to partner.

The subcommittee launched a K-12 deliverable in quarter 3 that provided nuclear energy curriculum and career opportunity exposure to South Carolina students through a virtual job shadow program.

The Supplier Subcommittee focused on recruiting and assisting small businesses in joining the nuclear supplier chain and established three focus areas: educating businesses about the opportunity; connecting companies to a regional supplier quality certification program; and fostering new business creation (entrepreneurs). The group worked in partnership with the Carolinas Nuclear Cluster who is leading an effort in South Carolina to map the nuclear energy supply chain and to create and execute an intensive on-boarding process for small businesses that can serve the nuclear industry.

The Marketing and Communications committee launched in quarter 3 with three main objectives: promote regional assets and opportunities; provide educational information to the public; and develop the region's reputation as an industry leader.

The SMR Subcommittee (Innovation) established the following four focus areas: research and development, commercialization, education/workforce training, and manufacturing. The team helped host an international SMR Conference in Columbia April 19-20 that attracted over 250 people, which was more than double the normal conference size. The project team has begun to reach out to SMR technology vendors to talk about collaborative opportunities to bring activity to the region.

The Workforce Subcommittee (Workforce) established the following three focus areas: two year technical college programs, bachelors and masters programs, and K-12 outreach. The team launched a K-12 project to provide nuclear energy curriculum and career opportunity exposure to South Carolina students through a virtual job shadow program.

The Industry Engagement Subcommittee (Manufacturing/Supply Chain) established three focus areas: educating businesses about the opportunity; connecting companies to a regional supplier quality certification program; and fostering new business creation (entrepreneurs). The team assisted the Carolinas Nuclear Cluster, which is leading an effort in South Carolina to map the nuclear energy supply chain and to create and execute an intensive on-boarding process for small businesses that can serve the nuclear industry, recruit local suppliers (15 companies) to attend a hands-on certification workshop. The team also launched a new partnership with the Greater Columbia Chamber of Commerce and the City of Columbia to leverage the region's Business in Motion program to engage local businesses via interviews.

The Marketing and Communications committee established three main objectives: promote regional assets and opportunities; provide educational information to the public; and develop the region's reputation as an industry leader. The team launched development of a website to showcase the initiative.

The SMR Subcommittee completed its first deliverable that was launched in January during quarter 2. The committee launched a project to develop a description document that demonstrated to SMR manufacturers, potential operators, and regulators that South Carolina offers a unique combination of resources to develop, manufacture, and service SMRs nationally and internationally.

The Workforce Subcommittee provided letters of support for Midlands Technical College to win regional designation from the National Science Foundation as a Regional Center for Nuclear Education and Training.

Key Outcomes:

Clean Energy:

- Chernoff Newman submitted a project scope with deliverables for developing a Midlands Clean Energy regional brand, focused on fuel cells and nuclear energy.
- Chernoff Newman developed a logo and brand for the nuclear initiative called NuHub.

Fuel Cells:

- The project team established committees to focus on new company formation, existing industry support, new industry engagement, and workforce development.
- The project team identified research and innovation as an area where we can have a significant impact on economic development opportunities.

Nuclear Energy:

- The SMR, Workforce, Supplier, and Marketing/Communications subcommittees established focus areas and objectives

Subtask 2.3 Establish Project Goals and Metrics

Narrative*:*

Clean Energy:

Fuel Cells: During the project, the working groups set goals for all program areas identified in 2.1, but focused specifically on establishing goals and metrics for the two priority projects mentioned.

- Research and Development:
  - Submit and win (1) federal research grant for hydrogen, fuel cell or related materials work (USC).

- Tech Transfer and Commercialization: Fuel Cell Challenge (FCC 2012)
  - Recruit (15) student team submissions through the FCC 2012
  - Recruit (10) industry-driven "challenge" submissions through the FCC 2012
  - Award $75,000 in research and commercialization funded to student teams through the FCC 2012

    *The following measures of success have been put into place for this program:
    - # of new technologies submitted through FCC 2012 contest
    - # of new business concepts submitted through FCC 2012 contest
    - # of students teams participating in the FCC 2012 contest
    - # of new disclosures and patents filed through USC research
    - # of new companies formed around USC research
    - # of private and follow on capital secured as a result of program
    - # of private sector partners engaged through the program

- Existing Industry Outreach: Fueled™
  - Hold (4) quarterly collaboration meetings with local industry participants
  - Conduct (10) BRE interviews to determine competitive position and challenges for local industry

- New Industry Outreach:
  - Expand new industry relationships by (25) new companies in 12 months
  - Identify and attend (2) major trade shows per year focused on the hydrogen and fuel cell industry.
  - Recruit (1) new fuel cell business or existing expansion into the Columbia region

- Education/Workforce Development:
  - Recruit (10) new students into Midlands Tech Fuel Cell Technician training program

- Technology Deployment and Demonstration:
  - Secure (1) hydrogen and/or fuel cell powered vehicle in the next 12 months

- Secure (1) backup power demonstration project in the next 12 months

- Marketing & Communications:
  - (4) press releases in next 12 months
  - (200) new contacts added to distribution list
  - (50) new stakeholders added to LinkedIn group
  - (2) nationally connected original stories published

Nuclear Energy: Each committee listed in 2.1 established goals, deliverables, and project metrics. The metrics listed below are tied to the goals and committee activities listed in 2.1

SMR Subcommittee:
- 1 SMR vendor recruited to the state for manufacturing
- 1 conference or trade show hosted
- 1 Endowed Chair position filled at the University of South Carolina to focus on innovation in nuclear energy

Workforce Subcommittee:
- National designation of a workforce program and or regional excellence earned
- K-12 virtual job shadow program launched for SC public school students
- Collaboration of educational institutions (2 year and 4 year higher education programs) formed

Industry Engagement Subcommittee:
- 5 new stakeholders added
- 1 landing party recruited to the region
- Participation in 2 conferences outside the region

Marketing/Communications Subcommittee Metrics:
- Publish 4 E-Newsletters
- Launch website
- Host 1 public outreach event on nuclear energy
- Publish 3 news articles or press releases

Key Outcomes:
Fuel Cells:
- All program areas have metrics attached to established goals
- Priority projects have specific measures of performance

Nuclear Energy:
- All program areas have metrics attached to established goals

Task 3.0 Program/Project Planning

Target/priority projects are highlighted in the following sections.

Subtask 3.1 Establish Budget and Funding Mechanism

Narrative:
Fuel Cells:

Tech Transfer and Commercialization: Establish an innovation competition focused 100% on identifying, accelerating, and commercializing technologies being discovered at the University of South Carolina.

- The key project developed for this deliverable is The Fuel Cell Challenge 2012, which has been renamed The Fuel Cell Challenge V. This was an industry driven innovation challenge that connects interdisciplinary student teams at the University of South Carolina to real companies to spur innovative approaches to solving actual challenges facing the industry. The goal was to spur new technologies and innovations that could be developed and deployed into the commercial market for economic impact.
- The funding for this project was secured from three local entities and totaled $75,000. This funding will support the student teams participating in the Challenge.

Existing Industry Outreach: Establish an industry advisory board to help increase private sector involvement in our economic development activities.

- The key project developed for this deliverable is called Fueled. Fueled is a business retention and expansion program, based on the Business In Motion program created by the City of Columbia in 2008. It is an effort to engage existing startups and technology firms in the fuel cell space to increase their competiveness by addressing common issues, opportunities and leveraging partnerships established through the Fuel Cell Collaborative.
- The funding for this project will be derived by the in-kind match from team members of the Fuel Cell Collaborative.

New Industry Outreach: Identify and attend (2) major trade shows per year focused on the hydrogen and fuel cell industry.

- The key trade shows identified for this deliverable are the 2012 World Hydrogen and Energy Conference in June and the 2012 Fuel Cell Seminar and Energy Exposition in November. Attendance at both of these trade shows not only served to develop new industry relationships and support industry outreach, but it played a critical role in maximizing the impact of the Fuel Cell Challenge V.
- A majority of the funding for this project was secured from the partners of the Fuel Cell Collaborative (SCRA, City of Columbia, USC, Midlands Technical College, and EngenuitySC).

Technology Deployment and Demonstration: Identify and recruit a target distribution or warehouse location for a pilot fuel cell forklift demonstration project

- The key project identified to assist with this deliverable was to host a Fuel Cell Forklift 101 session to educate local distribution or warehouse companies about the benefits and economic value proposition of switching to fuel cell forklifts.
- The funding for this project was derived by the in-kind match from team members of the Fuel Cell Collaborative and the South Carolina Hydrogen and Fuel Cell Alliance. Meeting space was donated by the Midlands Technical College.

The project team prioritized and streamlined the lists of projects in order to match deliverables with available resources. Budgets and funding mechanisms were established for the following target/priority projects: Tech Transfer and Commercialization via the Fuel Cell Challenge project, Existing Industry Outreach via development of an Industry Advisory Board, New Industry Outreach via participation in key industry trade shows/conferences, and Technology Deployment and Demonstration via a pilot fuel cell forklift demonstration project. The steps to complete this subtask were to define priority projects and secure funding for the remaining two key project areas – Research and Development and Education/Workforce Development. Target/priority projects for these two areas are outlined below with the funding mechanism noted.

Research and Development: Support the University of South Carolina's growth in research and expand the depth, breadth, and quality of hydrogen, fuel cell, and future fuels research taking place in the Greater Columbia region.

- The key projects developed for this deliverable included supporting the expansion of the Columbia fueling station by deploying a portable hydrogen initiative to focus on getting technologies in place at the station and assisting with company recruitment to foster more academic and corporate research partnerships at the University of South Carolina.
- The funding for this project was derived by the in-kind match from team members of the Fuel Cell Collaborative.

Education/Workforce Development: Support hydrogen and fuel cell education outreach and workforce development in the Greater Columbia region.

- The key projects developed for this deliverable included expanding the marketing and promotion of fuel cell programs at Midlands Technical College and the University of South Carolina and hosting a fuel cell demonstration and public day to increase awareness and acceptance for fuel cell technology.
- The funding for these projects was derived by the in-kind match from team members of the Fuel Cell Collaborative and additional funding was secured via community partnerships.

Nuclear Energy: The project subcommittees (SMR/Innovation, Workforce, Industry Engagement, and Marketing/Communications) established focused areas and objectives. Each subcommittee also developed annual and quarterly plans for the remainder of the grant period that focus on completing priority projects. As of the end of the project period, all subcommittees projects have been outlined and received a separate line item in the FY13 operating budgets. These projects are supported by bridge funding provided from local city and county partners, in-kind partners' resources, and the remaining grant funding.

The stakeholders developed a membership-based funding model. Team members conducted an analysis to compare and contrast the various industry collaborative membership models that exist within the region and or state to determine what model would work best to support the nuclear project. After securing funding from the City of Columbia and Richland County, it was determined that the most appropriate funding mechanism to support activities through 2012 was community sponsorship. The team re-evaluated the membership model mechanism over the course of the Fall of 2012 in order to have a more sustainable funding mechanism in place for the project going forward, and the final structure was approved by the Executive Committee in August 2012 and finally adopted by the larger Task Force Committee in October 2012. A budget for the next fiscal year was approved and finalized in June by the executive committee members overseeing the project.

Key Outcomes:
Fuel Cells:

- Funding secured for all priority projects

Nuclear Energy:

- Membership-based funding model identified as final funding mechanism

Subtask 3.2 Establish Roles & Responsibilities

Narrative:
Fuel Cells:

Tech Transfer and Commercialization: Establish an innovation competition focused 100% on identifying, accelerating, and commercializing technologies being discovered at the University of South Carolina.

- The key project developed for this deliverable is The Fuel Cell Challenge V as described above in subtask 3.1. All roles, responsibilities, deliverables and tasks have been assigned to team members for the implementation as per the project plan.

- Representatives from the following partner organizations made up the project team: SCRA, University of South Carolina, Innovista (part of the university), Midlands Technical College, SC Launch, and EngenuitySC.

Existing Industry Outreach: Establish an industry advisory board to help increase private sector involvement in our economic development activities.

- The key project developed for this deliverable is described above in subtask 3.1. All roles, responsibilities, deliverables and tasks have been assigned to team members for the implementation as per the project plan.
- Representatives from the following partner organizations made up the project team: SCRA and EngenuitySC.

New Industry Outreach: Identify and attend (2) major trade shows per year focused on the hydrogen and fuel cell industry.

- The key trade shows identified for this deliverable are the 2012 World Hydrogen and Energy Conference in June and the 2012 Fuel Cell Seminar in November.
- Representatives from the following partner organizations attended those trade shows and managed the process: SCRA and EngenuitySC.

Technology Deployment and Demonstration: Identify and recruit a target distribution or warehouse location for a pilot fuel cell forklift demonstration project

- The key project identified to assist with this deliverable was to host a Fuel Cell Forklift 101. All roles, responsibilities, deliverables and tasks were assigned to team members for the implementation as per the project plan.
- Representatives from the following partner organizations made up the project team: SCRA, EngenuitySC, the South Carolina Hydrogen and Fuel Cell Alliance, LiftOne, and Midlands Technical College.

Nuclear Energy: When the project subcommittees (SMR/Innovation, Workforce, Industry Engagement, and Marketing/Communications) were established all roles, responsibilities, deliverables and tasks were assigned to the members of each committee. Committee meetings are held every other month to review current tasks and assign new tasks as needed to implement the projects to completion.

Key Outcomes:
Fuel Cells:

- All roles, responsibilities, deliverables and tasks have been assigned for 4 of the 6 priority projects

Nuclear Energy:

- All roles, responsibilities, deliverables and tasks were assigned to the members of the committees formed in Quarters 2 & 3
- All Subcommittees are meeting on a regular basis, are executing the identified action plans and are seeing results

Subtask 3.3 Establish Timeline for Implementation

Narrative:
Fuel Cells:

Tech Transfer and Commercialization: Establish an innovation competition focused 100% on identifying, accelerating, and commercializing technologies being discovered at the University of South Carolina.

- The key project developed for this deliverable is The Fuel Cell Challenge V as described above in subtask 3.1. The following timeline has been developed from planning to implementation to conclusion.

Project Official Public Launch:	June 3, 2012 at WHEC
Industry Challenge Submissions Deadline:	June 29, 2012
Faculty Review/Selection of Challenges	July, 2012
FC Challenge Announcement for Student Teams	September 4, 2012
Student Team Submission Deadline Closes:	October 22, 2012
Review of Student Team Submissions:	October 24-26, 2012
Industry Notified if Challenge Selected	October 29, 2012
Student Teams Notified:	October 31, 2012
Challenge Awards Announced:	Nov 5, 2012 at Fuel Cell Seminar
Student Teams Begin Projects	January 2013
Mid-term Review Meeting:	March, 2013
Final Team Presentations/Pitches:	May, 2013
Fuel Cell Challenge Project Closes:	June, 2013

Existing Industry Outreach: Establish an industry advisory board to help increase private sector involvement in our economic development activities.

- The key project developed for this deliverable is called Fueled as described above in subtask 3.1. The following timeline has been developed from planning to implementation to conclusion as a general guideline. The goal is to have 4 meetings a year.

Coordination and Planning for First Meeting:	April 2012
First Meeting:	late May/early June 2012
Second Meeting:	September 2012
Third Meeting:	December 2012
Fourth Meeting:	March 2012

New Industry Outreach: Identify and attend (2) major trade shows per year focused on the hydrogen and fuel cell industry.

- The key trade shows identified for this deliverable were the 2012 World Hydrogen and Energy Conference in June and the 2012 Fuel Cell Seminar in November.

  World Hydrogen Energy Conference: June 3-7, 2012, Toronto, Canada
  Fuel Cell Seminar: November 5-8, 2012, Uncasville, Connecticut

Technology Deployment and Demonstration: Identify and recruit a target distribution or warehouse location for a pilot fuel cell forklift demonstration project.

- The key project identified to assist with this deliverable is hosting a Fuel Cell Forklift 101. The following timeline was developed for planning and implementation. If companies express interest post-seminar about deploying a fuel cell forklift fleet, then the project team will assist with that.

Coordination and Planning for Seminar:	April 2012
First Meeting:	late May/early June 2012
Company Follow Up:	September 2012

Master project timelines for implementation were approved for the following programs: Tech Transfer and Commercialization via the Fuel Cell Challenge project, Existing Industry Outreach via development of an Industry Advisory Board, New Industry Outreach via participation in key industry trade shows/conferences, and Technology Deployment and Demonstration via a pilot fuel cell forklift demonstration project. The project team had to adjust the timelines for Existing Industry Outreach and Technology Deployment and Demonstration to ensure full participation of project stakeholders. Those approved adjustments are outlined below.

Existing Industry Outreach: Establish an industry advisory board to help increase private sector involvement in our economic development activities.

- The following adjusted timeline was approved and implemented. The goal is to have 1 meeting bi-annually.

Coordination and Planning for First Meeting:	September 2012
First Meeting:	October 2012
Second Meeting:	April 2013

Technology Deployment and Demonstration: Identify and recruit a target distribution or warehouse location for a pilot fuel cell forklift demonstration project.

- The following adjusted timeline was approved and implemented. If companies express interest post-seminar about deploying a fuel cell forklift fleet, then the project team will assist with that.

Coordination and Planning for Seminar:	October 2012
First Meeting:	November 2012
Company Follow Up:	December 2012/January 2013

The steps to complete this subtask were to secure approval of a timeline for implementation for the remaining two key project areas – Research and Development and Education/Workforce Development. Target/priority projects for these two areas are outlined below. The approved timelines are noted below.

Research and Development: Support the University of South Carolina's growth in research and expand the depth, breadth, and quality of hydrogen, fuel cell, and future fuels research taking place in the Greater Columbia region.

- The key projects developed for this deliverable centered on assisting with fuel cell company recruitment. Company recruitment will be an ongoing outreach activity without a defined timeline, but below is a list of some recent activity.

Company Outreach and Recruitment	October – November 2012
Company Meetings and Tours	November 2012
Company Visits to SC	January 2013

Education/Workforce Development: Support hydrogen and fuel cell education outreach and workforce development in the Greater Columbia region.

- The key projects developed for this deliverable are executing a marketing strategy that includes plans for a fuel cell demonstration and educational outreach. The following timelines were developed and executed from planning to implementation to conclusion.

Marketing Outreach Strategy	
Strategy Development:	August 2012
Public Outreach Implementation:	September 2012
Continued Follow Up and Targeted Outreach:	Ongoing

Narrative:

Nuclear Energy: Each committee developed annual plans in and used these goals to establish quarterly target deliverables to ensure successful completion of the annual goals established. Therefore, the timeline developed from implementation to completion for these quarterly deliverables is 90 days. The annual goals, including the Quarter 8 objectives, are listed below as examples.

Each committee developed annual plans in Quarter 5 and used these goals to establish quarterly target deliverables to ensure successful completion of the annual goals established. All activities were focused on developing a robust, three year roadmap for FY13 which was developed, finalized and used by each committee to guide annual and quarterly plans for FY13. The approved and finalized roadmap is included in the Appendix.

SMR Subcommittee:

Annual Goals:

- Develop relationships with SMR vendors and stakeholders to assist with recruiting supply chain members

- Support the development of educational, professional, and R&D programs in the region
- Recruit and host at least 1 trade show focused on SMR technology and application

Quarter 8 Goals (July – September)

- Respond appropriated to an SMR announcement from DOE
- Develop strategy for partnerships and services with SMR vendors
- Work with team to provide vendors with all support mechanisms

Workforce Subcommittee:

Annual Goals:

- Develop a workforce development strategy to expand training programs for the future and current workforce
- Pursue creation of an internationally recognized training center or program
- Build a collaboration of the regional two year technical schools and four year college programs
- Host briefing with public school superintendents about clean energy jobs
- Meet with education institutions to discuss the idea of a collaboration
- Develop an outline for the international center of nuclear training and education in the region
- Inventory workforce programs in the region
- Define roles for a collaboration of the 4 educational institutions in the region
- Enhance K-12 jobs presentation

Quarter 8 Goals (July – September):

- Complete academic assessment program to use in marketing materials
- Finalize interview/survey details as part of our strategic plan for the training center
- Draft workforce education and outreach opportunities and materials

Industry Engagement Subcommittee:

Annual Goals:

- Connect companies to a regional supplier quality certification program
- Foster new business creation by reaching out to current industry members to assess needs and working with economic developers to promote the region
- Recruit and host 1-2 industry trade shows and conferences
- Hold briefing with SC Dept. of Commerce to talk about clean energy activities in the region
- Develop value proposition to connect with industry and supplier
- Recruit 1 new company to join stakeholders
- Host 1 international trade show in Feb
- Recruit 4 new companies to join stakeholders
- Conduct 8 business retention and expansion interviews with current stakeholders
- Host a round table event to engage current industry and provide a networking platform

Quarter 8 Goals (July – September):

- Successful Industry Engagement Roundtable event
- Create a better plan for industry engagement and recruitment, including research into best practices
- Complete all Business in Motion interviews

Marketing/Communications Subcommittee:

Annual Goals:

- Assist with communications and outreach to key stakeholders and supporters
- Develop a NuHub website and quarterly newsletter to promote regional assets and opportunities
- Host 1 community outreach program to provide educational information to the public
- Develop a standard regional clean energy presentation for stakeholders to use
- Develop a 3 year marketing/communications plan

- Host a public event for community members, business leaders, and industry to connect and learn more about the region's clean energy initiatives
- Coordinate a fall public event with a local business organization
- Establish a committee to plan a fall industry conference focused on clean energy

Quarter 8 Goals (July – September)

- Execute a successful PowerHour Event
- Have a marketing tool that can support membership outreach efforts
- Narrow our conference list down to a priority of 5 opportunities for FY13
- Appropriately responded to SMR announcement from DOE

Key Outcomes:

Fuel Cells:

- Project timelines from planning to implementation to conclusion have been developed for all 6 of the priority projects

Nuclear Energy:

- All project timelines from planning to implementation to conclusion have been developed for priority projects using an annual and quarterly planning system

COMPLETION OF TASKS 1.0-3.0 MARKS THE MILESTONE OF CLOSING OUT PHASE 1: CLEAN ENERGY CLUSTER DEVELOPMENT

PHASE 2: CLEAN ENERGY CLUSTER PROGRAM BUILD OUT

Task 4.0 Program Build Out, Pilot, and Launch

This phase/task involved building out the programs, materials, communications, virtual and physical infrastructure required to effectively launch the programs. In addition, this task involved a "soft" launch of all priority pilot projects to insure programmatic and operational success before full scale deployment.

Narrative:

Clean Energy: The scope of this project focused on establishing a formal clean energy economic and workforce development strategy for the Midlands. The initial phase of the project focused on creating collaborative partnerships in entrepreneurship training, workforce development, business expansion and recruiting, and commercialization activities. This involved recruiting business, higher education, workforce, and economic development partners to participate in their respective areas of development. As per the Department of Energy's Fuel Cell Technologies Program, the project sought to accelerate the commercialization and promote the early adoption of hydrogen and fuel cell technologies, nuclear technologies, and other clean energy solutions. The project teams of the fuel cell program and the nuclear program developed action oriented roadmaps to sustain a clean energy economic and workforce development strategy for the next two years for the Midlands. Both approved and finalized roadmaps are included in the Appendices E&F (Fuel Cell Collaborative) and Appendix K (NuHub). As part of the overall clean energy effort, partnerships with the following organizations were launched and/or enhanced during the program to foster a more collaborative and supportive environment for entrepreneurship, workforce development, business expansion and recruiting, and commercialization activities for clean energy technologies.

- **Center for Entrepreneurial & Technological Innovation (CETI)**: CETI was launched in Quarter 7 and is the University of South Carolina's startup resource center supporting innovation and technology-based early state ventures. CETI's mission is to educate, connect, and accelerate companies into the market place by helping aspiring entrepreneurs turn their innovations into high growth ventures. Members of the project teams and project partners - Innovista, EngenuitySC, SCRA – worked together to develop the

concept of CETI. The organization has already been integrated into the activities of the fuel cell and nuclear programs to provide entrepreneurial and commercialization support services.

- **Midlands Education & Business Alliance (MEBA)**: MEBA works in Richland, Lexington, and Fairfield Counties to connect students, parents, adult learners, educators, and employers to education and career opportunities through programs and partnerships of business education, faith, and community. Throughout this program, and as was demonstrated in the report through activities like our Virtual Job Shadow program, MEBA served an integral role in the workforce development programs under the fuel cell and nuclear projects.
- **Business in Motion Program**: The City of Columbia and the Greater Columbia Chamber of Commerce co-facilitate Business in Motion, an existing business retention and expansion program. The program interviews businesses within the same industry and pulls data together to examine how the community can help solve real problems for businesses. The program has already become part of the nuclear project and will continue to be a priority as the group looks to develop a report by fall 2013. The program will be launched as part of the nuclear project's industry engagement and marketing and communications efforts.
- **Navigating from Good to Great Foundation:** The Navigating from Good to Great Foundation works toward developing a region that is creative, vibrant, and diverse and supports intellectual capital as well as investment capital resulting in well-paying knowledge-based jobs. As part of their mission, Navigating from Good to Great partnered with both the nuclear and fuel cell projects to create an environment in our region that supports clean energy growth, entrepreneurial activity and collaboration. Through this important partnership, the region can focus on creating an economy that is well suited for clean energy growth.

Fuel Cells: As per the scope of the project, the fuel cell program most closely addresses the eliminating of non-technical barriers to widespread deployment and increasing opportunities for market expansion through commercialization support. The project team developed priority projects to address these issues and developed a detailed annual plan that includes strategies and crucial results for each quarter and annual metrics by which to measure project performance in June 2013.

We have seen some of our biggest successes through these six initiatives:

1. The Fuel Cell Challenge, currently in its fifth iteration, has produced over $5 million in funded projects that have yielded 20 new partnerships or companies. With our new structure, described in detail in Task 3.3, in place, we feel like this initiative has the ability to broaden our industry engagement efforts, showcase the talent in our region, give students at the University of South Carolina real world experience working with mentor fuel cell companies, and lead to other funded projects in the future.
2. As mentioned in Subtask 3.3, the Industry Advisory Board initiative became an important one for the purpose of growing our cluster. At the end of the project period, we had recruited, planned, and executed our first Industry Advisory Board meeting. This group was brought together for the purpose of judging our Fuel Cell Challenge V student submissions, so we were able to immediately engage them in one of our larger initiatives. We plan to meet again with this group in late May of 2013.
3. Noted in the Subtasks below outlining the highlights from our pilot programs, trade show activity was outlined in Phase 1 as an important part of our outreach plan. Through a successful project plan and implementation, our team was able to attend over 10 different industry trade shows marketing our project and the region over the course of this program. This outreach led to new industry partnerships and relationships, and has even been the impetus behind new companies moving into our region.
4. Our Fuel Cell Fork Lift project, as outlined in Subtask 3.3 as part of our technology deployment and demonstration efforts, was planned and organized to take place in November, but two days before the event was to take place the event was rescheduled. Invitations were distributed to over 20 participants, including representatives from Amazon, Walmart, QVC and Michelin. Though the final event didn't take place as planned, we are now working with each contact individually to select another date in February 2013 when we will reschedule and execute.
5. Company Recruitment is an area that in the more recent quarterly reporting we didn't have much activity. However, coming out of the latest trade show event, the 2012 Fuel Cell Seminar and Energy Exposition,

we now have three different company leads interested in relocating to our region. We plan to continue working with those companies to arrange visits and meetings to help them find a new permanent home.

6. The final piece of Subtask 3.3 that has had activity over the course of the program and success in our pilot activities is our educational outreach. Over the past eight quarters we have provided educational presentations at community groups around town educating them on the benefits of fuel cells. Additionally, we have sponsored and presented at local business conferences articulating the cost benefit value of the technology. And finally, we have held professional development sessions with educators around the region talking about the efforts ongoing with our fuel cell project and encouraging them to teach their students about the clean energy technology.

Nuclear: As per the scope of the project, the nuclear energy program most closely addresses supporting the advancement of nuclear power as a resource by supporting commercialization, workforce development, and existing industry expansion through increasing competitiveness. The nuclear program roadmap was developed and approved. The project team met separately with each committee (SMR/Innovation, Workforce, Industry Engagement, and Marketing/Communications) to complete a detailed annual plan using the template developed by the fuel cell program project team. With that annual plan in place, the nuclear program then drafted, recommended and adopted a long-term financial model that will keep the project financially viable for years to come. This included final approval and adoption of the nuclear program value proposition, which is included in the appendix. This also includes final approval and adoption of our membership model, which provides a roadmap for project fundraising and support from private member companies. This document is also available in the appendix.

Here are some of the pilot programs that have seen the most success:

1. During the course of this federal grant period, our team was able to use our stakeholders, our project planning and our pilot programs to work toward bringing next generation nuclear technology to South Carolina. We are currently in partnerships with vendors who are competing for funds to develop Small Modular Reactors, and because of the resources developed through this nuclear project, we have been able to support those efforts to bring a huge economic opportunity to our state.
2. The workforce programs continue to be a huge part of our nuclear project, and our pilot programs continue to develop and grow. We have begun interviewing industry leaders as part of our regional training center vision. This regional training center would be developed as a result of this project, and would provide training capacity to students locally, domestically, and internationally. Additionally, we have created a project plan for K-12 pipeline development to integrate a nuclear marketing program tailored at students, parents, teachers and counselors educating them on the job opportunities in nuclear. That work will continue to be a huge part of our portfolio in the years ahead.
3. Our industry engagement efforts were the driving force behind our program plan to make our nuclear project financially independent. Our Subcommittee worked together to successfully develop and approve a Three Year Roadmap, a Value Proposition and a funding model. Additionally, the group plans to take on the task of performing a gap analysis to identify where our region is strong, and where we need improvement. That includes addressing needs for our industry partners like minority recruitment programs that will help this nuclear project provide value for the long-term.
4. The final effort entails our marketing and communications plans, and specifically, through this project our nuclear program was able to put together the pieces to develop our first brochure. This brochure will be used to market our region to other areas of the country, as well as to recruit new industry members to our organization within our region.

Subtask 4.1 – 4.5: Highlights of Successes Related to Each Initiative:

These subtasks were intended to demonstrate the success of the pilot program launch and full scale implementation for the clean energy initiative – specifically executed through the nuclear and fuel cell projects. In an effort to capture all of the individual successes of the Midlands Entrepreneurship Training Initiative (Subtask 4.1), the Midlands Clean Energy Workforce Development Initiative (Subtask 4.2), the Midlands Clean Energy Industry Engagement Initiative (Subtask 4.3), the Midlands Entrepreneurship and Commercialization

Initiative (Subtask 4.4), we have put together an overview of the highlighted accomplishments of each component and demonstrated the impact by Subtask 4.5: Program Validation and Full Scale Implementation.

Fuel Cells:

- FY11 Accomplishments and Highlights:
  - $5,000,000+ in private sector investment in hydrogen and fuel cell commercialization
  - Trulite expands Columbia, SC manufacturing activities at the Midlands Tech Enterprise Campus
  - Bio-Blu and Weylchem Sustainable Materials launch new ventures in the Columbia, SC region and receive $125,000 in startup support through the Fuel Cell Challenge 2010
  - Logan Energy launches Columbia-based mobile power business unit at Midlands Technical College
  - South Carolina is recognized as a "Top Five Fuel Cell State" by Fuel Cells 2000
- FY11 Research and Development Highlights:
  - USC welcomed Jochen Lauterbach, Endowed Chair, Center of Economic Excellence for Strategic Approaches to the Generation of Electricity (SAGE)
  - USC Chemical Engineering student Chenghao Yang recently won the Bernard S. Baker student award in recognition of his work in fuel cells with Dr. Ken Reifsnider
  - South Carolina Governors School Student Matthew Lee receives $100,000 Proton Energy Scholarship from Proton Energy Systems at NHA 2010
- FY11 Development and Deployment Projects:
  - SCRA announced a partnership with U.S. Departments of Energy, Defense, and the Interior to transition the Fort Sumter National Monument to an energy self-sufficient system utilizing solar energy generation and fuel cell backup power.
  - The Federal Transit Administration "Hydrogen Hybrid Bus Project" successfully completed an 18 month deployment with the CMRTA and USC
  - University of South Carolina, in partnership with the City of Columbia, announced a DOE funded "Hydrogen Internal Combustion Engine (ICE) Shuttle Bus" 12 month demonstration project with University and City routes.
  - The Fuel Cell Collaborative contributed $50,000 toward a $400,000 "Product Validation Project" to support the commercial rollout of the Trulite Hydrocell™ energy storage solution for its new line of fuel cell generators
- FY11 New Company Formation:
  - The Collaborative launched the Fuel Cell Challenge 2010, an innovation and business plan competition; with (2) companies receiving grant funding (2) new startup firms launched in the Greater Columbia region: Bio-Blu and Weylchem Sustainable Materials. Both companies have committed to establishing a presence at the USC-Columbia Technology Incubator
  - Logan Energy launches Logan Energy Carolinas, a mobile power business unit in the Midlands Technical College Business Accelerator
- FY11 Business Retention & Expansion:
  - Trulite announced the relocation of its North American headquarters to Columbia, SC
  - Trulite and Boroscience concluded an Office of Naval Research energy storage project
  - Trulite secured $5,000,000 in investment capital to launch next generation fuel cell generator production in Columbia, SC
  - Weylchem and Boroscience announced a strategic partnership to develop commercial-scale boron chemical compounds for energy storage
  - Midlands Technical College celebrates the first graduates of its Fuel Cell Technician Training Program
- FY11 New Industry Engagement:
  - The Fuel Cell Collaborative worked to position the Columbia, SC region as a world class destination for the hydrogen and fuel cell industry. Through extensive marketing, communications, event participation, industry visits, and industry hosting, the Collaborative

generated interest, opportunities and leads for the fuel cell industry in Columbia, SC. The following are highlights from the previous year's activities:

- FY11 Industry Events Attended:
  - Fuel Cell Seminar and Expo 2010 in San Antonio, Texas: 95 exhibitors and close to 1,000 participants. Winners of the Fuel Cell Challenge 2010 were announced at the conference
  - NHA Conference & Expo 2010 in Long Beach, CA: 2,700 attendees, 150+ speakers, 100+ exhibitors.
  - Fuel Cell Collaborative launched the Fuel Cell Challenge 2010 at the event
  - Green is Good for Business Conference 2010 in Columbia, SC: 300+ attendees, 40 exhibitors, fuel cell collaborative exhibited with booth
  - FCHEA 2011 in Washington, DC: 800 attendees, 45 exhibitors, fuel cell collaborative exhibited and presented at the conference
- FY11 Lead Generation:
  - (2) new leads generated from marketing, communications, event attendance, and targeted recruiting campaigns
  - (6) company visits in 2010
- FY11 Industry Visits & Meetings Hosted:
  - U.S. General Fuel Cell
  - FDI Energy
  - Cygnus Atratus
  - Alexium
  - Plasma Kinetics
  - Bio-Blu
  - Logan Energy
- FY11 Industry Collaborations:
  - BASF Fuel Cell (USC)
  - Ultracell (USC)
  - ENrg (USC)
  - Plug Power (SCRA)
  - Protonex (USC)
  - Logan Energy
- FY12 Accomplishments and Highlight:
  - University of South Carolina, in partnership with the City of Columbia, announced a second DOE funded "Hydrogen Internal Combustion Engine (HICE) Shuttle Bus" 12 month demonstration project with two buses now running on University and City routes. The buses are available for use by any group in Columbia filling out a request form at www.fuelcellcollaborative.com.
  - The bus has been featured or is scheduled to be featured as part of 11 community events, in addition to regular service routes through USC. Requesting groups include Leadership Columbia, The Columbia Visitors Bureau, Department of Education, Saluda Shoals Park, The Nature Conservancy, Columbia Opportunity Resource, and conference organizers for Nuclear Energy Insider magazine.
    - Est. Visibility: 150,000 people
    - Est. Transported: 1210 people
  - The Fuel Cell Collaborative contributed $48,000 toward fuel cell research equipment for the Idea Lab at Innovista
  - The Fuel Cell Collaborative launched a project to find a warehouse/distribution center in the midlands that would transition from battery powered forklifts to the more economical fuel cell powered forklifts; both the City of Columbia water treatment plant and Midlands Technical College Enterprise Campus have been identified as demo sites for fuel cell powered forklifts
- FY12 New Industry Engagement:

  - The Fuel Cell Collaborative worked to position the Columbia, SC region as a world class destination for the hydrogen and fuel cell industry. Through extensive marketing, communications, event participation, industry visits, and industry hosting, the Collaborative generated interest, opportunities and leads for the fuel cell industry in Columbia, SC. The following are highlights from the previous year's activities:
- FY12 Events Attended:
  - Fuel Cell Seminar and Expo 2011 in Orlando, Florida: 95 exhibitors and close to 1,000 participants; Fuel Cell Collaborative exhibited with the SC Pavilion, sponsored the Welcome Reception, and announced that Weylchmen Sustainable Materials, winner of the 2010 Fuel Cell Challenge, was opening a pilot production facility in the Columbia-area. Greg Hilton presented at the Bernard Baker Student Awards
  - Green is Good for Business Conference 2011 in Columbia, SC: 300+ attendees, 40 exhibitors; Fuel Cell Collaborative exhibited with booth and sponsorship
  - SC Renewable Energy Forum: 200+ attendees, 25 exhibitors; Fuel Cell Collaborative exhibited with booth and sponsorship
  - World Hydrogen and Energy Conference 2012 in Toronto, Canada: An estimated over 1,000 attendees, 300 presenters, 200 poster displays and delegates from 55 countries; Fuel Cell Collaborative will sponsor a Networking Break, exhibit with a booth, and launch the Fuel Cell Challenge 2012 at the event
  - Washington Fuel Cell Summit 2012 in Washington, DC
- FY12 Industry Collaborations:
  - NetShape Technologies
  - BASF
  - ATK
  - Applied Catalysts
  - ONR
  - Ceramic Fuel Cells
  - TopLine Energy Systems
  - Matheson
- FY12 Economic Development:
  - Midlands Technical College officially join the Fuel Cell Collaborative in 2011
  - LoganEnergy announced small scale fuel cell power division in Columbia, SC with an estimated 25 jobs and $1.5M in capital investment
  - Trulite has secured significant new capital in 2011/2012 and is in the process of raising more capital investment to expand in the region (numbers to be publicized at a later date)
  - Fuel Cell Challenge V will launch in June 2012 at the World Hydrogen Energy Conference and will focus on engaging students (undergrad and graduate) at USC with industry experts through an innovation competition to solve fuel cell industry problems
  - The Fuel Cell Collaborative plans to award 3 student teams with $25,000 to support the pursuit of novel technologies and applications that leverage the expertise at USC to solve real world industry problems
  - By investing in innovations stemming from university research, new discoveries, and technologies, the Fuel Cell Collaborative hopes to uncover new business opportunities that can be commercialized to launch startup companies
- FY13 Highlights:
  - Fuel Cell Challenge V - a global program that connects industry entrepreneurs to undergraduate and graduate student teams at the University of South Carolina to solve industry challenges
    - Fuel Cell Challenge was launched in June 2012 at the World Hydrogen Energy Conference in Toronto, Canada
    - Nearly 10 companies from around the US and as far away as Australia submitted entries for our Industry Challenge
    - 8 student teams submitted applications for funding

        - A judging panel of local industry and entrepreneurial experts selected 3 teams for funding at $25,000 a piece, for a total of $75,000 in awards
    - South Carolina was named a "Top Five Fuel Cell State" by Fuel Cells 2000, a major industry publication, for the third year in a row
- FY13 Industry Engagement:
    - Fuel Cell Collaborative has partnered with Thermo King, Nuvera/Hess, and Sysco to investigate opportunities for new market entry in the refrigerated fuel cell truck space
    - Fuel Cell Collaborate partnered with LiftOne to host a second round of Lift Truck Lunch and Learn sessions for local companies to learn about the benefits and value proposition for this technology
- FY13 Deployment Projects
    - Continued and wrapped up pilot program from 2011 for 2 Hydrogen Internal Combustion Engine (HICE) Buses with Ford, Department of Energy, and the University of South Carolina
- FY13 Events Attended:
    - Fuel Cell Collaborative represented the City of Columbia and other members at the following conferences:
    - 2012 Fuel Cell Seminar & Energy Exposition in Uncasville, Connecticut with booth exhibition space, a key card sponsorship, and a speaker opportunity
    - 2012 World Hydrogen Energy Conference in Toronto, Canada to kick off Fuel Cell Challenge V through networking hour sponsorship and exhibit booth
    - 2012 Green is Good for Business Conference with booth exhibition space and a presenter opportunity

NOTE: Samples of the publicity, presentation materials, and web traffic generated by the Fuel Cell Collaborative Activities are included in Appendices G-J.

Nuclear:

- FY12 Innovation Highlights:
    - The University of South Carolina appointed Dan Gabriel Cacuci to be holder of the first of two endowed chairs in the nuclear sciences through its relationship with NuHub
    - San Diego-based General Atomics gave $900,000 to establish the General Atomics Center for Development of Transformational Nuclear Technologies, part of a new SmartState Center of Economic Excellence at the University of South Carolina to develop strategies for improving and enhancing the use of nuclear energy
    - NuHub partnered with two small modular reactor (SMR) vendors - NuScale Power LLC and Holtec International - to compete for one of two awards under a $452M Department of Energy grant that will support the launch of the first SMR in United States
- FY12 Workforce:
    - The National Science Foundation awarded a $3.1 million grant to establish the Regional Center for Nuclear Education and Training (RCNET), linking seven Southeastern states including South Carolina
    - Midlands Technical College will lead SC's efforts in this through the award of a $3.1M National Science Foundation grant. MTC will create collaboration that seeks to meet the critical demand for skilled nuclear technicians in a unified, systematic way. South Carolina Electric & Gas Company (SCE&G); Aiken, Denmark, Florence-Darlington and Orangeburg-Calhoun technical colleges; and Spartanburg Community College will also be key supporters in SC.
    - An educational collaborative composed of representatives from Midlands Technical College, USC, Benedict, and SC State was established to help connect the nuclear training and education programs in the region

  - NuHub, in partnership with SCANA, developed a virtual job shadow program for nuclear energy careers for the SC Personal Pathways program which encourages middle school students to choose a career cluster to guide their studies
  - NuHub, in partnership with the Midlands Education and Business Alliance, have developed an outreach program to connect with school Superintendents, principles, and PTO/PTA groups to raise awareness about the local job options in the nuclear industry
- FY12 Industry Engagement:
  - NuHub hosted 3 international conferences with 650+ combined attendees through partnership with England-based Nuclear Energy Insider
  - NuHub, in partnership with the Columbia Chamber and the City of Columbia's Business in Motion program, launched an initiative to focus on business retention and expansion of current regional industry members
  - NuHub launched a Round Table series to provide a networking forum for industry members and to recruit new participants to NuHub
- FY12 Community Outreach and Industry Exposure:
  - *Patrick Moore, Co-Chair CASEnergy, Visit to Green Quad at University of South Carolina* - May 16, 2012
    - Result: Engaged audience of 50+ interested Columbians, provided arguments in favor of nuclear energy as key source of clean, sustainable energy, and provided educated, reusable responses to negative nuclear sentiments or arguments.
  - *Nuclear Energy Insider SMR Conference NuHub Breakfast for Media & Attendees* - April 24, 2012
    - Result: Grew newsletter distribution list by 100 subscribers, Feature article from *Columbia Regional Business Report*, Formally released Holtec International Partnership Press Release to 289 publications.
  - *Annual Nuclear Science Cafe hosted by EngenuitySC* - April 10, 2012
    - Result: 100+ attendees engaged in an analysis of nuclear energy and its impact internationally and on the Midstate.
- FY13 Highlights:
  - NuHub hosted its first CityTV interview with Steve Byrne from SCANA and Barrie Kirk from Midlands Technical College to highlight the economic development opportunities in the nuclear industry
  - NuHub received the "Innovator Award" from the Southern Growth Policies Board for our efforts in workforce development programs
  - NuHub launched a Virtual Job Shadow for Nuclear program in partnership with Microburst Learning and SC Personal Pathways to promote nuclear energy careers to public school students across SC
  - NuHub attended the 2012 Girls in Science Day at the State Museum, the Lower Richland High School STEM Career Day and the Columbia Minority Enterprise Development Conference to promote nuclear careers in the Midstate
  - In partnership with NuHub, USC recruited and appointed Dr. Dan Cacuci as the Endowed Chair in Advanced Materials and Nuclear Power - the first of two funded endowed chairs SmartState Center for Nuclear Science and Energy

NOTE: Samples of the publicity, presentation materials, and web traffic generated by NuHub Activities are included in Appendices L-N.

PHASE 1 AND 2: CONCLUSION

Program Viability in the Long-Term

At the conclusion of Phase 2 and Task 4.0, we determined through the planning in Phase 1 and the implementation Phase 2, that our clean energy initiatives are fully functional and capable of continuing past the closure of this federal funding opportunity. Because of all of the steps taken to identify and secure stakeholder engagement, develop a strong program for implementation, plan out the steps to execute and then implement, we see a viable future for the fuel cell and nuclear project.

Fuel Cells:
The fuel cell project has taken the lessons learned through the pilot programs outlined in this document and created a pathway forward that outlines objectives and goals for the next three years. Through the successes of the Fuel Cell Challenge program, the fuel cell project plans to develop a commercialization program focused on strategic partnerships, investor relations, and identifying industry-relevant emerging technologies at USC. There has already been a tremendous amount of positive partnership development through the focus of Fuel Cell Challenge V, and we anticipate those relationships to continue to prosper.

The fuel cell project is also going to spend the next three years focusing on partnerships and innovations to create inexpensive hydrogen that is portable, financially sustainable, and useful to the city and community. We have plans to introduce a new fuel cell bus into the community that will help us toward that goal, but keeping our infrastructure investment viable will be a top priority in the coming years.

Through this clean energy initiative, we have discovered an opportunity to establish our region as a hub or destination for fuel cell research and development. Through projects internally and with partners like supply chain mapping, academic and corporate research efforts, and active company recruitment, we hope to grow the clean energy environment and become a home to new companies in the future.

And finally, through the fuel cell project our team has uncovered opportunities to expand the existing uses of fuel cell technologies. We have and will continue to support hydrogen and fuel cell technology deployment through strategic partnerships, expanded understanding of innovations and existing infrastructure, and targeted research, education, and recruitment. Already we have forged partnerships to explore early market entry into the fuel cell powered refrigerated truck market, and these are just the initial steps to establishing a long-lasting program.

Nuclear
The nuclear project has made significant progress in the duration of this federal funding opportunity. Given the success of our stakeholder engagement, program planning and pilot implementation, we have been able to secure buy in from each of our Executive Committee Team members and general Task Force members to usher in a new era of financial independence supported by member organization

In conjunction with our industry, academic and community partners, we hope to spend the next two years identifying and nurturing the growth of nuclear-related high tech companies. Additionally, we plan to work with SC SmartState Endowed Chairs program and the newly established Center for Nuclear Energy Science and Engineering to expand research and development activity in the Midstate.

Another component of the nuclear project that has real long-term benefits is our workforce development efforts. In the coming years, our project hopes to build a regional center for nuclear training that can appear to the workforce in the state, the region, the nation and internationally. And in order to ensure there's robust workforce for the next decade our team will also implement a K-12 pipeline pilot program to educate young people on the benefits of a career in nuclear.

And finally, perhaps some of our most exciting opportunities stem from efforts to bring the next generation of nuclear technology to our state through the Small Modular Reactor development project. Through our industry engagement efforts and in partnership with our partner vendors, we are competing to be the new home for the first ever commercialized demonstration SMR unit. This will totally change the dynamic of our nuclear project and give it long term viability in developing a brand new workforce, and new supply chain, a new manufacturing facility, etc. This project has the ability to impact the state economically in a way no other industry has – to the tune of billions of dollars of investment. Because of the pilot projects made possible by this grant, we are in a position to catapult our region into economic prosperity, and we look forward to the many possibilities in the years to come.

3. PROJECT TASK/MILESTONE SCHEDULE

Task #	Subtask	Milestone Description	Original Planned	Revised Planned	Actual	% Complete	Progress Notes
1.0		**Stakeholder Engagement**	**2/28/11**			**100.0%**	**See Project Progress Report**
	1.1	Stakeholders	1/7/11			100.0%	
	1.2	Establish Leadership & Management Team	1/31/11			100.0%	
	1.3	Responsibilities	1/31/11			100.0%	
	1.4	Establish Organizational & Collaboration Structure	2/28/11			100.0%	
2.0		**Program Development**	**5/31/11**			**100.0%**	**See Project Progress Report**
	2.1	Identification & Inventory of Target Projects	3/31/11			100.0%	
	2.2	Establish Project Scopes and Deliverables	3/31/11			100.0%	
	2.3	Establish Project Goals & Metrics	5/31/11			100.0%	
3.0		**Program/Project Planning**	**8/31/11**			**100.0%**	**See Project Progress Report**
	3.1	Establish Budget & Funding Mechanisms	6/30/11			100.0%	
	3.2	Establish Partners, Roles & Responsibilities	7/29/11			100.0%	
	3.3	Establish Timeline for Implementation	8/31/11			100.0%	
4.0		**Program Build Out, Pilot, and Launch**	**11/30/11**			**100.0%**	**To begin in Q7**
	4.1	Entrepreneurship Training Program	10/31/11			100.0%	
	4.2	Clean Energy Workforce Development Initiative	10/31/11			100.0%	
	4.3	Clean Energy Industry Engagement Initiative	10/31/11			100.0%	
	4.4	Entrepreneurship and Commercialization Initiative	10/31/11			100.0%	
	4.5	Program Validation and Approval	11/30/11			100.0%	
						0.0%	
						0.0%	

4. PROJECT SPENDING

Award # DE-EE0003218 covers this program, which is reimbursement driven grant funding. The project unofficially launched on July 1, 2010, and the project period of performance (PoP) was September 1, 2010. As such, the team is reporting project technical and financial progress starting July 1, 2010.

Progress Overview: For the entire project, the project team has expended $968,705 in cumulative funding. At its conclusion, the project used 100% of total budget and appropriately managed cash flow and estimated monthly burn rates. The bulk of funding was expended on the sub award to Sagacious Partners and on subcontracts established with vendors and project partners.

At the request of DOE program managers, in Q6, EngenuitySC modified our budget to reflect changes in how we accounted for direct and indirect expenditures. EngenuitySC completed the following:

- Removed indirect rate applied to any cost share as cost share did not flow through the EngenuitySC accounting system (in kind).
- Adjusted all notes, comments, and assumptions based on changes to the budget.
- Removed indirect charge from the Sagacious Partners travel expenditure
- Sagacious Partners submitted and received approval for a revised indirect rate of 23% and fringe rate of 41.8%.
- EngenuitySC submitted and received approval for an indirect rate of 19%.
- EngenuitySC submitted a revised budget and is awaiting approval from DOE contracts management.

Table 1 – Project Spending By Quarter and Cumulative

Project Spending by Quarter								
Project Spending and Estimate of Future Spending								
Qtr	From	To	Federal Share	Recipient Share	Total for Project*	Cum. Fed Share	Cum. Recipient Share	Cum. for Project*
1	10/1/10	12/31/10	$56,821	$45,943	$102,764	$56,821	$45,943	$102,764
2	1/1/11	3/31/11	$47,947	$52,153	$100,100	$104,768	$98,096	$202,864
3	4/1/11	6/30/11	$98,491	$151,558	$250,048	$203,259	$249,653	$452,913
4	7/1/11	9/30/11	$49,239	$48,080	$97,319	$252,499	$297,733	$550,232
5	10/1/11	12/31/11	$27,211	$45,222	$72,434	$279,710	$342,956	$622,666
6	1/1/12	3/31/12	$52,547	$41,997	$94,544	$332,257	$384,953	$717,210
7	4/1/12	6/30/12	$96,423	$38,627	$135,050	$428,680	$423,580	$852,260
8	7/1/12	8/30/12	$71,320	$45,125	$116,445	$500,000	$468,705	$968,705
Totals			**$500,000**	**$468,705**	**$968,705**			

Notes on Table 1:

1. Recipient share of outlays includes all in kind cost share commitments provided in the approved proposal
2. EngenuitySC has included an indirect cost share calculation in the budget that has been approved by the U.S. Department of Energy.

Table 2 – Project Spending by Cost Element

Project Spending By Cost Element						
Element	**Quarter 8**			**Total Project**		
	Budget	**Actual**	**% Expended**	**Budget**	**Actual**	**% Expended**
Personnel	$0	$0	#DIV/0!	$0	$0	#DIV/0!
Fringe Benefits	$0	$0	#DIV/0!	$0	$0	#DIV/0!
Travel	$0	$0	#DIV/0!	$0	$0	#DIV/0!
Equipment	$0	$0	#DIV/0!	$0	$0	#DIV/0!
Supplies	$0	$0	#DIV/0!	$0	$0	#DIV/0!
Other	$0	$3,750	#DIV/0!	$0	$7,300	#DIV/0!
Sub-recipients	$35,582	$19,616	55%	$285,849	$226,758	79%
Sub-contractors	$54,859	$81,913	149%	$603,025	$658,221	109%
Total Direct Costs	**$90,441**	**$105,279**	**116%**	**$888,874**	**$892,279**	100%
Indirect Costs	$8,276	$11,165	135%	$76,982	$76,426	99%
Total Project Costs	**$98,717**	**$116,444**	**118%**	**$965,856**	**$968,705**	100%

Notes on Table 2:

1. Sub-contractor costs include both federal and non-federal (cost share) portions for total project budget.
2. Total project period of performance shown here is 24 months of projected costs for the project
3. Sagacious Partners, as mandated in the contract is identified as the sub-recipient for reporting purposes.

5. APPENDICES – ATTACHMENTS AND DELIVERABLES

5.1 Appendix A: Financial Performance Tables/Graphs

Figure 1 – Budget Breakout by Cost Element

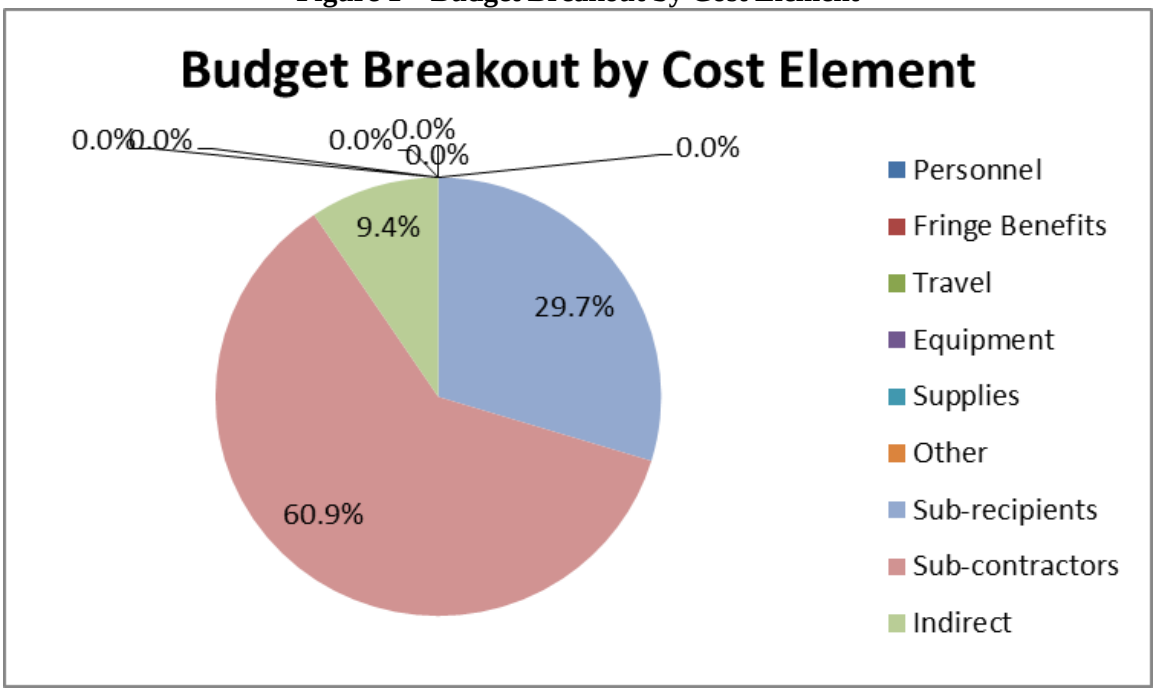


Figure 2 – Budget Breakout by Federal Subcontractor

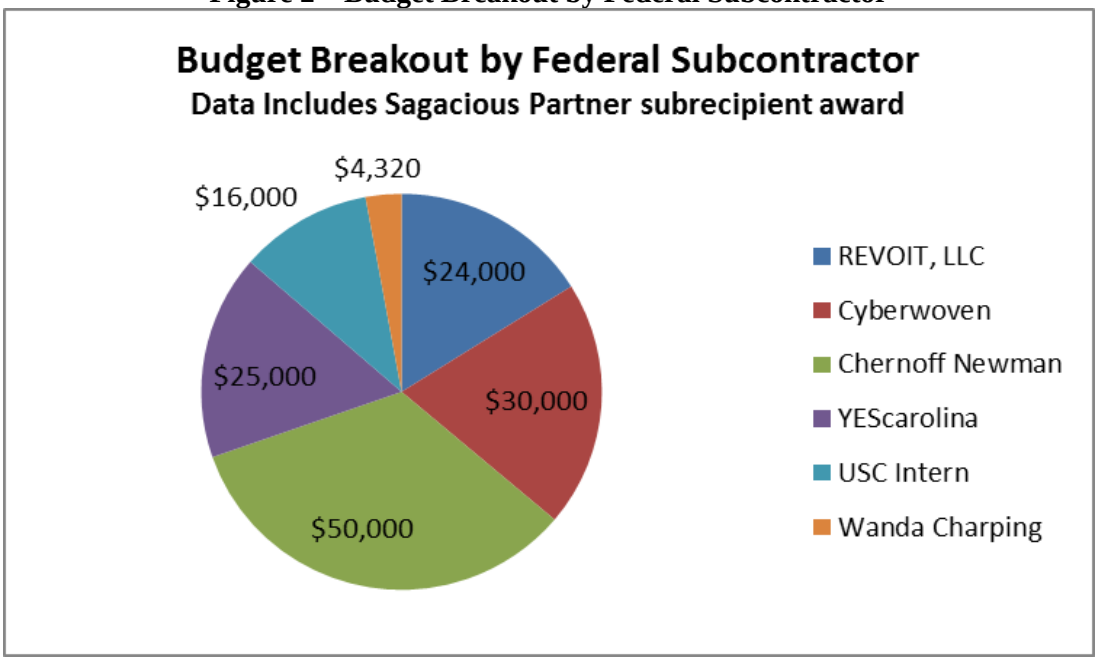
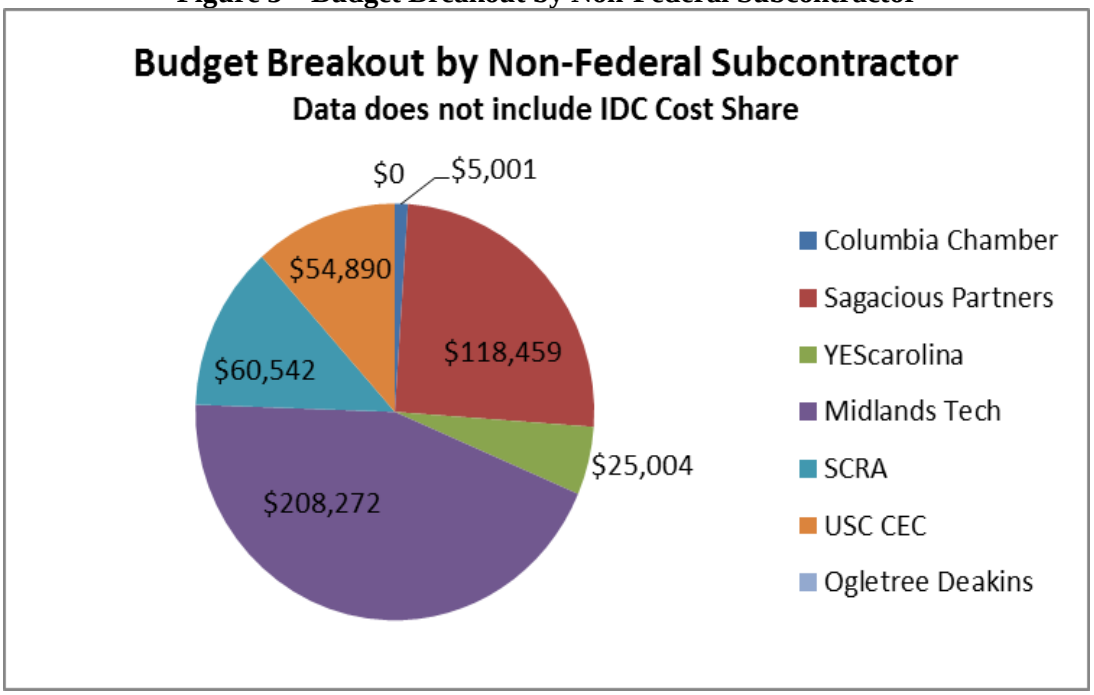


Figure 3 – Budget Breakout by Non-Federal Subcontractor



5.2 Appendix B: Project Stakeholders

Fuel Cells Initiative:

Fuel Cell Collaborative Executive Committee

- City of Columbia: Mayor Steve Benjamin, Mayor of the City of Columbia
- EngenuitySC: Larry Wilson, EngenuitySC Executive Committee Member
- MTC: Dr. Sonny White, President of Midlands Technical College (MTC)
- SCRA: Bill Mahoney, CEO of SCRA
- USC: Don Herriott, Director of Innovista

Fuel Cell Collaborative Management Team Members

- Ann Marie Stieritz - Director of Business Solutions, USC Innovista
- Frank Avery - Marketing Project Manager, EngenuitySC
- George Hutton - Executive Director, EngenuitySC
- Greg Clark - Midlands Zone Manager, SC Launch
- Jim Gambrell - Director, City of Columbia Office of Economic Development
- Kyle Michel - Owner, Michel Law Firm
- Meghan Hughes - Senior Project Manager, EngenuitySC
- Russ Keller - VP for New Business Development Vice President, ATI
- Scott Greenway - President and COO of Greenway Energy
- Tom Ledbetter - Director, MTC Enterprise Campus

Nuclear Energy Initiative:

Executive Committee**:**

- Stephen A. Byrne – COO, SCE&G
- Sonny White - President, Midlands Technical College
- Don Herriott – Director, USC Innovista Partnerships
- Donald Goldbach, Director of Manufacturing Strategy, Westinghouse Electric Company

Innovation Subcommittee: Ted Speth

- Chuck Kelly
- Doug Rosinski
- Don Herriott
- Steve Byrne
- Sonny White
- David King/Ann Broadwater
- Steve Benjamin
- Phil Young

Workforce Subcommittee: Sonny White

- Chuck Kelly
- Barbara Blau
- Don Goldbach
- Dale Wesson
- Phil Young
- Grant Jackson
- Kelvin Washington
- Vareva Harris
- Dwayne Smiling

Industry Engagement Subcommittee: Don Herriott

- Co-Chair – Ann Marie Stieritz
- Regan Voit
- Tom Smentek
- Tony Ambler
- Barrie Kirk
- Taylor Miller
- Franklin Buchanan

Communications Subcommittee: Tony Ambler (Tom Ledbetter, Interim Chair)

- Amy Buu Keller
- Travis Knight
- Shawn Austin
- Lee Bussell
- Grant Jackson
- Kathryn McPhail

Task Force/Advisory Committee:

- Stephen A. Byrne – COO, SCE&G
- Sonny White - President, Midlands Technical College
- Don Herriott – Director, USC Innovista Partnerships

- Donald Goldbach, Director of Manufacturing Strategy, Westinghouse Electric Company
- Ann Marie Stieritz, Innovista
- Amy Buu Keller, Westinghouse
- Anthony Ambler, USC – College of Engineering and Computing
- Barbara Blau, DP Professionals
- Cary Alstadt, Westinghouse
- Cathy Novinger, Novinger QTR
- Chuck Kelly, TriLink Systems
- David King, CentralSC Alliance
- Doug Rosinski, Ogletree, Deakins Nash, Smoak & Smoak
- Dwayne Smiling, Benedict College
- Dr. Dan Cacuci, USC
- Dr. Travis Knight, USC
- Grant Jackson, Greater Columbia Chamber of Commerce
- Jim Gambrell, City of Columbia
- John Clemmons, Shaw
- Kyle Michel, Kyle Michel Law Firm
- Lauren Edwards, USC Innovista
- Lee Bussell, Chernoff Newman
- Natalie Cobb Henderson, Snelling
- Paul Livingston, Richland County Council
- Phil Young, TetraTech
- Regan Voit, GEN4 Energy
- Russ Keller, SCRA
- Shawn Austin, SC State
- Taylor Miller, Columbia CVB
- Tom Smentek, Westinghouse
- Tom Ledbetter, Midlands Technical College
- Vareva Harris, Benedict College

Management Team/Staff:

- Executive Director Support George Hutton
- Special Advisor Neil McLean
- Project Manager, Overall Meghan Hughes
- Marketing Manager Frank Avery
- Business Development Franklin Buchanan
- Financial Management Tory Sojourner
- Administration Robin Brown

5.3 Appendix C: Fuel Cell Collaborative Economic Impact Study

Midlands Hydrogen & Fuel Cell Center of Excellence – 2005-2009 Summary

USC Columbia Fuel Cell Collaborative

University of South Carolina
South Carolina Research Authority
EngenuitySC
City of Columbia

Background:
In 2005, ICF Consulting conducted a thorough and statewide analysis of South Carolina's next energy opportunities with hydrogen & fuel cells. It was determined that this industry represented a significant knowledge-based market opportunity for the state. Recommendations from that multi-partner study laid the groundwork for a 20 year vision for the region. The following recommendations and outcomes were prescribed for the first five years:

1. Build statewide and regional hydrogen & fuel cell leadership
2. Focus investments on a "discovery engine" with the goal of doubling research funding
3. Develop commercialization capacity through investments in infrastructure, intellectual property generation, and pre-seed and seed capital
4. Develop new incentives and programs to attract and retain companies into the center of excellence

Anticipated results from these recommendations were:

1. An increase in faculty and staff R&D jobs through research institutions
2. An increase in corporate R&D activities through research partnerships
3. The first H2/FC start-ups emerging from university and economic development efforts

The study recommended a strong focus on building knowledge creation in the short-term, as opposed to job/company creation which requires a longer-term perspective. All of the investment at this stage will start generating higher multipliers as the output of the discovery work is "captured" in the improved development system in the coming years.

Achievements & Results:

Over the past four to five years the Midlands region has made significant investments in the innovation pipeline for hydrogen & fuel cells. In turn, the region has achieved a substantial return on investment from its public & private investments in research, infrastructure, commercialization, and demonstration projects.

Total Regional Investments:	
State Research Investments (COEEs):	$5.0M
USC Research Investments (COEEs):	$11.4M
USC Innovista Investments (H2/FCs):	$19.0
H2/FC Project Investments:	$5.4M
Regional Economic Impact:	
Federal/Private Research Awards & Investments:	$59.2M
Federal/Private sector commercial investments:	$5.1M
Research, Development, & Commercial Partnerships:	40+
Commercial fuel cell projects:	20+
Disclosures, Patents, & Licenses:	40+
Company Formation (startups, recruited):	10
Total Employment (public/private sector):	100+ (est)
Total Investment:	$40.8M
Total Sponsored Research & Private Investment:	$64.3M
Return on Investment (total):	58%

Highlights

For a $40.8 million dollar investment, our region is expected to earn over $64.3 million dollars in federal and private sector investments in research, commercialization, and knowledge creation. This ratio represents slightly more than a 60% return on investment. In addition to outperforming our "discovery engine" goals, our region has generated over 100 high paying jobs in research, development, and commercialization through university activities and more than ten start-up or recruited companies, as well as laying the groundwork through industry collaborations for South Carolina to be an economic engine for future energy opportunities.

Our region has seen the proliferation of several key programs that are driving research and economic activity in our region. From the USC-Columbia Fuel Cell Collaborative, to Innovista, to the National Science Foundation Center for Fuel Cells, to the Solid Oxide Fuel Cell Center of Excellence at USC, to the Greater Columbia Fuel Cell Challenge; we have set the stage for accelerated growth of hydrogen & fuel cell commercialization by building a world class research & development foundation that will yield long-term job creation potential in the future.

USC Research, Development, & Demonstration Partnerships

By building a strong "discovery engine" and research foundation, the USC-Columbia Fuel Cell Collaborative is building partnerships with some of the country's (and the world's) most recognized companies, universities, and industry programs. The list below is a sampling of some of the organizations with whom the university has research partnerships in hydrogen & fuel cells, as well as industry partners working with the fuel cell collaborative:

Argonne National Laboratory
Boeing
Center for Transportation & the Environment (CTE)
Dana Corporation
Dantherm Power
Dow Corning
Entegris, Inc.
Faraday Technology
Fraunhofer Solar Institute
Fujifilm Manufacturing USA
Gas Technology Institute (GTI)
General Electric
General Motors
Hydrogenics
Jadoo Power Systems
Korean Institute for Energy Research
LiftOne
Logan Energy
Nanodynamics Energy
National Aeronautics & Space Administration (NASA)

National Renewable Energy Laboratory
North Carolina A&T University
Nuvera
Oak Ridge National Laboratories
Plug Power
Proterra
Sandia National Labs
Savannah River National Lab
South Carolina Energy Office
South Carolina Research Authority (SCRA)
Tennessee Technological University
Trulite
University of Queensland
U.S. Department of Energy (DOE)
U.S. Department of Defense (DOD)
U.S. Defense Logistics Agency (DLA)
U.S. Department of Homeland Security (DHS)
UTC Power

Demonstration, Commercialization, and Deployment Projects:

The Greater Columbia Fuel Cell Challenge, a program of the USC-Columbia Fuel Cell Collaborative, is a comprehensive public and private sector initiative with the expressed goal of making the Columbia, S.C. region the global model for the mass deployment of fuel cell applications and other alternative energy sources. Below are just some of the projects our region has supported since 2006.
Benedict College Backup Fuel Cell Project
Citizens School for H2 & FC Technology
Jadoo XRT First Responders Demonstration (DHS/FT. Jackson)
LiftOne/Hyrogenics Fuel Cell Forklift Demonstration
SCETV Fuel Cell Cameras
USC Fuel Cell Powered Segway Project
Boroscience Commercialization Project
MTC Fuel Cell Training Facility
Trulite KH4 Beta Test
City of Columbia-Dantherm Telecom Backup Power Project
LifeOne-Hydrogenics Fuel Cell Fork Lift Demo Project
Residential CHP Fuel Cell Pilot
USC-DOE-NASA Solid Oxide Fuel Cell Demo Project
USC Fuel Cell Scoreboard Power Project
Trulite Pilot Manufacturing Facility Project
Fort Jackson-DOE Stationary Fuel Cell Power Project
USC Solid Oxide Fuel Cell Project
FTA Hybrid Fuel Cell Bus Project
Columbia Hydrogen Fueling Station
SC Green Machine Competition

Company Formation:

Trulite
Boroscience International
DEnergy
Battery Design, LLC
Greenway Energy, LLC
Palmetto Fuel Cell Technologies
Palmetto Fuel Cell Design & Analysis
Fuel Cell South
Hydrogen Hybrid Mobility, LLC
NextGenEn

Definitions, Disclosures, and Assumptions	
Term	**Description**
Total State/USC Research Investments	This includes SOFC COEE, NanoPolymer COEE (25%), H2/FC Economy COEE, Renewable FC COEE, and the NSF FC Center. DOES NOT include Innovista investments
Total Sponsored Research Awards (approved)	Federal & Private Sector research awards for USC H2/FC
Total Sponsored Research Awards (pending)	FY08-09 pending sponsored research awards for USC H2/FC
Total Private Sector COEE Matches	Private sector matches for H2/FC USC Endowed Chairs programs (to date)
Total Fuel Cell Collaborative Investments	USC-Columbia Fuel Cell Collaborative (operations, project funds, marketing, & recruiting)
Total External Commercial/Project Investment	Federal & Private Sector project, company investments, or other economic impact
Total Company Formation	Start-ups, spin offs, and recruited companies (FY06-FY09; not complete)
Total Job Creation	Includes research, development, commercial, and public jobs created
Disclosure, Patents, Licenses	Disclosures, patents, and licenses reported by USC through FY09 (not complete)
Total H2/FC Commercial Projects (non-research)	USC Columbia Fuel Cell Collaborative Projects (since inception - 2006)
Total Investments (USC/SC/USC Columbia FCC)	Total investments made for USC H2/FC COEEs by USC and SC
Total Sponsored Research, Private Match, and Company Investment	Total sponsored research (approved & pending), COEE private sector match
Total Return on Investment (Total)	FY05-present (FY09 is not complete)
Total Return on Investment (Annualized)	FY05-present (FY09 is not complete)
State to Federal/Private Match	For every $1 invested by our region, it is the total garnered from external sources

5.4 Appendix D: Fuel Cell Collaborative FY11 Annual Report

USC-COLUMBIA FUEL CELL COLLABORATIVE

A collaboration between EngenuitySC, SCRA, the City of Columbia and the University of South Carolina

ANNUAL REPORT – FY 2011 (2010-2011)

USC — CITY OF COLUMBIA
FUEL CELL
COLLABORATIVE

SCRA collaboration innovation commercialization

UNIVERSITY OF SOUTH CAROLINA

CITY OF COLUMBIA, S.C. JUSTITIA VIRTUTUM REGINA

engenuitySC Building a bridge to the next economy in South Carolina.

ANNUAL PERFORMANCE REPORT 2010
Hydrogen & Fuel Cells Cluster

CLUSTER OVERVIEW:

The University of South Carolina - City of Columbia Fuel Cell Collaborative was formed by the University of South Carolina, the City of Columbia, EngenuitySC and the South Carolina Research Authority to position Columbia, SC as a leader in hydrogen and fuel cell innovation and technology. Its mission is to attract private sector partners, top fuel cell scientists, entrepreneurs and innovators to the Columbia region, as well as to collaborate with private sector leaders from all areas of the fuel cell market for the unprecedented deployment of fuel cell and other alternative energy technologies into multiple city, university and commercial applications throughout the region.

The activities supported by the collaborative are intended to help create and expand an "innovation pipeline" for fuel cell technology, which includes efforts to build a critical mass of research knowledge (the discovery phase), to commercialize the fruits of that research in specific applications for product creation and company formation (the development phase), and then to create incentives to grow and attract industries into enterprise clusters (the deployment phase). www.fuelcellcollaborative.com

STRATEGIC GOALS:

1. To support the growth of a world class research environment for hydrogen and fuel cells;
2. To recruit and retain private sector partners, entrepreneurs and innovators to the region;
3. To position Columbia, SC as a leader in hydrogen and fuel cell commercialization;
4. To build and support a robust hydrogen and fuel cell industry in the region; and
5. To build a platform for the creation of high-paying knowledge jobs through research and commercialization

KEY INITIATIVES:

1. Research Development: The collaborative works in partnership with the University of South Carolina to expand the depth, breadth, and quality of hydrogen, fuel cell, and future fuels research taking place in the Greater Columbia region.

2. Entrepreneurship and Commercialization: In partnership with USC and SC Launch, the collaborative seeks to identify, commercialize, and nurture new products stemming from discoveries being developed in the market and within the research universities of the region.

3. Business Retention and Expansion: The collaborative seeks to support the retention and expansion of the existing hydrogen and fuel cell industry in the region by collaborating on joint projects, federal programs, and connecting those firms to the support resources of the region.

4. New Industry Engagement: The collaborative works to identify, engage, and recruit active private sector partners into the Columbia region by connecting them to the hydrogen and fuel cell resources in our community, including the world class research at the University of South Carolina.

5. Marketing and Communications: This initiative is focused on engaging in both internal and external marketing and communications to raise awareness for the Columbia region as a world class destination for hydrogen and fuel cell technologies. The goal is to attract private sector partners, top fuel cell scientists, entrepreneurs and innovators to the Columbia region.

MANAGEMENT REPORT:

2010-2011 has been a banner year for hydrogen and fuel cells in the Midlands of South Carolina. Despite a challenging fiscal environment, investments by SCRA, the City of Columbia, and the University of South Carolina continued to drive our clean energy economy forward.

The Fuel Cell Collaborative continued to advance the knowledge economy development goals of the region by focusing on four main areas of activity: building a world class research environment, accelerating the commercialization of technology, expanding existing industry activity, and engaging new industry prospects.

The Columbia, SC region's reputation for innovation was bolstered when South Carolina was recognized as a "Top Five Fuel Cell State" by Fuel Cells 2000, a leading industry publication. This reputation was reinforced through investments from the Fuel Cell Challenge 2010 which awarded $125,000 in startup grants to high potential clean energy startups in the Midlands: Bio-Blu and Weylchem Sustainable Materials.

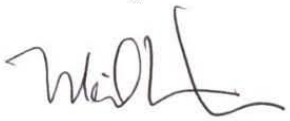
In addition, we have begun the transition from a research driven cluster to one driven by the private sector with continued growth by firms like Trulite, who announced the relocation of their corporate headquarters to Columbia, SC in early 2010 and will be announcing an expansion of that facility in early 2011. Columbia will welcome Logan Energy Carolinas into the region with the launch of a new business unit at the Midlands Tech Business Accelerator in the summer of 2011. Our collective investment in infrastructure continues to pay dividends with the Hydrogen Hybrid Bus demonstration ending in December 2010, a new Ford Hydrogen Internal Combustion Engine (ICE) shuttle bus service starting in early 2011, and a follow-on Hydrogen Hybrid Bus project announced for demonstration in mid-2012.

The University of South Carolina continues to establish a world class reputation in future fuels research and through a partnership with EngenuitySC and SCRA, announced a $3,600,000 fuel cell research award from the Defense Advanced Research Projects Agency (DARPA). Research teams are working to advance critical portable power technologies that will be used on the battlefields in Iraq, Afghanistan, and other areas of conflict. The University continued to expand its research activities in future fuels with complementary new Centers of Economic Excellence being announced in 2010-2011.

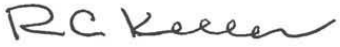
Further evidence of our progress could be seen at the National Hydrogen Association's Annual Conference and Expo 2010, where one future fuel cell scientist from the SC Governor's School for Science and Math was awarded a $100,000 scholarship from Proton Energy, a fuel cell manufacturer.

As our region emerges from the recession, our investments in clean energy will continue to position the Midlands for long-term growth and prosperity.

We are most grateful for our partners' continued investment in fuel cell innovation



T. Neil McLean
Executive Director
EngenuitySC



Russ Keller
Director, Emerging Markets Division
SCRA/ATI

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ACCOMPLISHMENTS AND HIGHLIGHTS:

Key Accomplishments:

- $4,000,000+ in federal hydrogen and fuel cell research and development grants awarded
- $5,000,000+ in private sector investment in hydrogen and fuel cell commercialization
- Trulite expands Columbia, SC manufacturing activities at the Midlands Tech Enterprise Campus
- Bio-Blu and Weylchem Sustainable Materials launch new ventures in the Columbia, SC region and receive $125,000 in startup support through the Fuel Cell Challenge 2010
- Logan Energy launches Columbia-based mobile power business unit at Midlands Technical College
- South Carolina is recognized as a "Top Five Fuel Cell State" by Fuel Cells 2000

Research and Development:

- EngenuitySC, in partnership with USC and SCRA, was awarded a $3.6M DARPA grant for "Advanced Power Solutions for Portable Applications"
- USC welcomed Jochen Lauterbach, Endowed Chair, Center of Economic Excellence for Strategic Approaches to the Generation of Electricity (SAGE)
- USC Chemical Engineering student Chenghao Yang recently won the Bernard S. Baker student award in recognition of his work in fuel cells with Dr. Ken Reifsnider
- South Carolina Governors School Student Matthew Lee receives $100,000 Proton Energy Scholarship from Proton Energy Systems at NHA 2010

Development and Deployment Projects:

- EngenuitySC was awarded a $500,000 Department of Energy grant for creating a clean energy cluster in the Midlands
- SCRA announced a partnership with U.S. Departments of Energy, Defense, and the Interior to transition the Fort Sumter National Monument to an energy self-sufficient system utilizing solar energy generation and fuel cell backup power.
- The Federal Transit Administration "Hydrogen Hybrid Bus Project" successfully completed an 18 month deployment with the CMRTA and USC
- University of South Carolina, in partnership with the City of Columbia, announced a DOE funded "Hydrogen Internal Combustion Engine (ICE) Shuttle Bus" 12 month demonstration project with University and City routes.
- The Fuel Cell Collaborative contributed $50,000 toward a $400,000 "Product Validation Project" to support the commercial rollout of the Trulite Hydrocell™ energy storage solution for its new line of fuel cell generators

New Company Formation:

- The Collaborative launched the Fuel Cell Challenge 2010, an innovation and business plan competition; with (2) companies receiving grant funding
- (2) new startup firms launched in the Greater Columbia region: Bio-Blu and Weylchem Sustainable Materials. Both companies have committed to establishing a presence at the USC-Columbia Technology Incubator
- Logan Energy launches Logan Energy Carolinas, a mobile power business unit in the Midlands Technical College Business Accelerator

Business Retention & Expansion:

- Trulite announced the relocation of its North American headquarters to Columbia, SC
- Trulite and Boroscience concluded an Office of Naval Research energy storage project

- Trulite secured $5,000,000 in investment capital to launch next generation fuel cell generator production in Columbia, SC
- Weylchem and Boroscience announced a strategic partnership to develop commercial-scale boron chemical compounds for energy storage
- Midlands Technical College celebrates the first graduates of its Fuel Cell Technician Training Program

New Industry Engagement:
The Fuel Cell Collaborative worked to position the Columbia, SC region as a world class destination for the hydrogen and fuel cell industry. Through extensive marketing, communications, event participation, industry visits, and industry hosting, the Collaborative generated interest, opportunities and leads for the fuel cell industry in Columbia, SC. The following are highlights from the previous year's activities:

Industry Events Attended:
- Fuel Cell Seminar and Expo 2010 in San Antonio, Texas: 95 exhibitors and close to 1,000 participants. Winners of the Fuel Cell Challenge 2010 were announced at the conference
- NHA Conference & Expo 2010 in Long Beach, CA: 2,700 attendees, 150+ speakers, 100+ exhibitors. Fuel Cell Collaborative launched the Fuel Cell Challenge 2010 at the event
- Green is Good for Business Conference 2010 in Columbia, SC: 300+ attendees, 40 exhibitors, fuel cell collaborative exhibited with booth
- FCHEA 2011 in Washington, DC: 800 attendees, 45 exhibitors, fuel cell collaborative exhibited and presented at the conference

Lead Generation:
- (2) new leads generated from marketing, communications, event attendance, and targeted recruiting campaigns
- (6) company visits in 2010

Industry Visits & Meetings Hosted:
- U.S. General Fuel Cell
- FDI Energy
- Cygnus Atratus
- Alexium
- Plasma Kinetics
- Bio-Blu
- Logan Energy

Industry Collaborations:
- BASF Fuel Cell (USC)
- Ultracell (USC)
- ENrg (USC)
- Plug Power (SCRA)
- Protonex (USC)
- Logan Energy

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Marketing & Communications:

- Press Releases:
  - "EngenuitySC and USC Receive $3.6M to Advance Fuel Cell Portable Power for the Department of Defense" – October 28, 2010
  - "USC-Columbia Fuel Cell Collaborative Announces Winners of the Fuel Cell Challenge 2010" – October 17, 2010
  - "SCRA CEO Bill Mahoney Joins Board of Fuel Cell and Hydrogen Energy Association" – December 9, 2010
  - "USC to Operate Hydrogen Powered Bus" – March 2, 2011

- Publications Covering the Midlands Fuel Cell Industry:
  - "Hydrogen Hybrid Bus to Provide Transit during 2010 Winter Olympics" – University of South Carolina, January, 2010
  - "Proterra Announces Move to South Carolina" – Proterra, February, 2010
  - "South Carolina's Clean Energy Revolution" – MidlandsBiz, February, 2010
  - "Genco Purchases 25 Hydrogen Fuel Cell Units from Plug Power in Graniteville, SC" – Genco Supply Chain Solutions, March, 2010
  - "Economic Development in the Clean Energy Age: South Carolina" – Fuel Cells Bulletin, March, 2010
  - "Fuel Cell Collaborative announces clean technology innovation competition" – Fuel Cell Collaborative, May, 2010
  - "South Carolina named a Top 5 Fuel Cell State" – FuelCells2000, May, 2010
  - "Looking to the Future by Developing SC's Hydrogen Fuel Cell Economy" – Columbia Business Monthly, January, 2011
  - "First Industrial Park to Supply Hydrogen Fuel Opens in South Carolina" – Fuel Cell Today, February, 2011
  - "Energy & Environment Issue" - Columbia Regional Business Report, February, 2011

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CLUSTER SCORECARD:

Hydrogen & Fuel Cells Scorecard – 2010-2011		
Category	**Metrics**	**Notes**
Regional Collaboration		
Executive Committee		Bill Mahoney (SCRA), Larry Wilson (EngenuitySC), Mayor Steve Benjamin (City of Columbia), Don Herriott (USC/Innovista)
Board of Advisors		University of South Carolina, Midlands Technical College, SCRA, Ogletree Deakins, New Carolina, Columbia Chamber of Commerce, MPT, City of Columbia, SC Energy Office, USC College of Engineering, Nexsen Pruet, Chernoff Newman, Central SC Alliance, Santee Cooper, Robinson, McFadden & Moore, SC Hydrogen and Fuel Cell Alliance, SCE&G, Sequentus LLC
Management Team		Neil McLean, Greg Hilton, Russ Keller, Katherine Robinson, Barry Blitch, Radu Vitoc, Stewart McKenzie, Jim Gambrell. Note: Radu Vitoc and Stewart McKenzie transitioned off the management team in 2011 and Greg Clark (SC Launch) and Barry Blitch transitioned on.
Industry Activity		
New Companies	2	New Companies: Weylchem Sustainable Materials, Bio-Blu will launch in 2011
Company Expansion	1	Expansion: Trulite announces plans to expand production capacity and staffing in Columbia Corporate offices in 2011
Total # of Companies	11	Trulite, Weylchem Sustainable Materials, Bio-Blu, NextGenEn, Palmetto Fuel Cell Analysis & Design, Palmetto Fuel Cells, Hydrogen Hybrid Mobility, Logan EnergySC, Boroscience International, Greenway Energy, and DEnergy.
Corporate Investment	$5.75M	1) Trulite secures $5M in investment capital to support Columbia, SC expansion; 2) Weylchem commits to $500K investment in new spin off Weylchem Sustainable Materials, 3) Logan Energy Carolinas launches new facility with $250K in Columbia, SC
Industry Engagement		
Industry Events Attended	4	Fuel Cell Seminar 2010, NHA Annual Conference 2010, Green is Good for Business, FCHEA 2011
Industry Leads Generated	20	Alexium, BASF Fuel Cells, Bio-Blu, Bloom Energy, Blue Nano, Cube Catalytics, Cygnus Atratus, ENrG, Exxon Mobile, FDI Energy, Logan Energy, Plasma Kinetics, Plug Power, Protonex, US General Fuel Cell, Violet Fuel Cells, Seimens Fuel Cells, Ultracell, Weylchem
Company Visits	7	Bio-Blu, Cygnus Atratus, FDI Energy, Plasma Kinetics, BASF Fuel Cell, U.S. General Fuel Cell, Logan Energy
Development & Deployment Projects		
H2 ICE Shuttle Bus	$150,000	EngenuitySC, SCRA, City of Columbia and USC partnered with U.S. DOE on a hydrogen powered internal combustion engine shuttle bus to operate for 12 months in and around USC campus and City of Columbia business district
Trulite Hydrocell Validation Project	$400,000	EngenuitySC, through the Fuel Cell Collaborative invested $50,000 to support a $400,000 Hydrocell™ validation and testing program in anticipation of commercial deployment of Trulite products

Fuel Cell Challenge 2010	$125,000	The Fuel Cell Collaborative invested $125,000 in seed grant funding in two innovative new startups launching in the Greater Columbia region in early 2011
Research & Development Projects		
Federal Funding	$4,100,000	EngenuitySC/USC DARPA Portable Power Research Project, EngenuitySC Clean Energy DOE Project. Note: Report does not include new federal projects by SCRA or USC
Research Faculty	7	New Endowed Chair in Strategic Approaches to the Generation of Electricity (SAGE) added, plus new research faculty with Future Fuels (fuel cells) research
Economic Impact		
New Jobs Created - Commercialization	35	Trulite: 25 jobs anticipated by end of 2011, Weylchem: 5 jobs estimated by end of 2011, Logan Energy: 5 jobs estimated by end of 2011
New Jobs Created - Research	10	10 FTE people were added in 2010-2011 at the University of South Carolina as a result of major federal funding awards in hydrogen and fuel cell technology

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5.5 Appendix E: Fuel Cell Collaborative FY12 Action Plan

USC — CITY OF COLUMBIA
FUEL CELL
COLLABORATIVE

USC Columbia Fuel Cell Collaborative – Action Plan FY2012

Key Objectives for FY2012 Program of Work:
The collaborative is seeking to fulfill its mission and goals through focusing on six key areas over the next 12 months in the areas of discovery, development, and deployment.

1. Business Retention and Expansion: Establish an industry engagement framework based on an industry cluster model and directly participate in the expansion of key Midlands companies

2. New Business Formation: Establish and pilot a fuel cell challenge commercialization program focused 100% on emerging fuel cell and related energy technologies at the University of South Carolina

3. Research & Development: Lay the structural groundwork for The University of South Carolina to secure several major energy-related federal research and development programs over the next five years.

4. Environment and Infrastructure: Improve the environment to support hydrogen and fuel cell technology deployment through projects focused on growing demand for technology applications

5. Collaboration Management: Expand the human and financial resources available through expanding the management team, project stakeholders and partners; integrating the private sector into the collaborative model, and securing additional working capital.

6. Marketing and Communications: Refresh the brand and create a more effective sales, marketing and communications platform for the future

Program Initiatives:

1. **Economic Development – Start Ups, Spin Offs, & Commercialization**
   Goal: To increase the number, depth, breadth, and quality of commercially viable new start-ups and spin-offs in the Greater Columbia area focused on hydrogen, fuel cells and clean tech.

   a. **Key Outcomes**
      i. Launch a successful Fuel Cell Challenge within the University of South Carolina
      ii. Identify a key list of promising fuel cell related energy technologies with commercial potential at USC
      iii. Spin out (3) new competitive companies from USC intellectual property

   b. **Strategies**
      i. Focus Fuel Cell Challenge concept 100% on emerging fuel cell related energy technologies at USC
      ii. Identify and secure USC internal champions to support this program (high level)
      iii. Recruit and build out a project team that includes internal and external partners in key areas
      iv. Integrate business student consulting assignments into the program
      v. Award small seed grants amongst multiple potential projects
      vi. Identify and define the financial mechanism for awards/support and secure financial commitments from key beneficiaries
      vii. Develop simple and repeatable process for deploying program on a regular basis
      viii. Integrate existing startup support resources into the competition

2. **Economic Development – Business Retention and Expansion**
   Goal: To establish programs that provide support for growth and expansion of existing hydrogen and fuel cell companies in the midlands.

   a. Key Outcomes
      i. Strengthen the collaboration between Columbia's existing fuel cell industry
      ii. Better integrate existing fuel cell companies into the Fuel Cell Collaborative framework
      iii. Maximize the growth potential and economic impact of Logan Energy and Trulite's activities in the Columbia, SC market
      iv. Accelerate the growth of existing pre-commercial startups in Columbia (NextGenEn, Weylchem Sustainable Materials, and Bio-Blu)

   b. Strategies
      i. Establish an industry advisory group to identify resources, share best practices, and connect more directly into needs of the existing fuel cell industry
      ii. Generate additional exposure for existing companies with potential end users of technology through collaborative programs
      iii. Perform a business retention and expansion survey with existing companies to identify key needs and opportunities
      iv. Create specific technology demonstration events that showcase current company product offerings and connect dots with resource providers

3. **Economic Development – External Industry Recruiting**
   Goal: To recruit new hydrogen, fuel cell, and clean energy companies into the Greater Columbia area.

   a. **Key Outcomes**
      i. Land (1) major hydrogen and fuel cell manufacturing establishment in the Columbia, SC region
      ii. Expand the supply chain for hydrogen and fuel cells with target technology partnerships for existing industry
      iii. Expand partnerships with key economic development entities to create more recruiting activities

   b. **Strategies**
      i. Brief the SC Department of Commerce (SCDOC) on fuel cell market and opportunities
      ii. Establish regular economic development dialogue with Central SC Alliance and the SCDOC to insure inclusion on projects
      iii. Partner with existing fuel cell companies to identify gaps in the supply chain and target companies/industries to recruit into Columbia market

4. **Discovery & Development – Basic/Applied Research & Development**
   Goal: Support USC's efforts to grow basic and applied research and development leadership in hydrogen, fuel cells, and other clean energy technologies to increase economic activity.

   a. Key Outcomes
      i. Position the University of South Carolina to win a Power and Energy UARC in FY2013
      ii. Position the University of South Carolina to develop a new fuel cell research and testing facility/program/center in FY2013
      iii. Win (1) major federally funded fuel cell research and commercialization program in partnership with USC in FY2012

   b. Strategies
      i. UARC:
         1. Develop a tactical plan for how to position Columbia and SC's assets within the UARC feasibility study
         2. Develop a government relations plan to support the creation and deployment of a UARC in Columbia, SC
         3. Inventory research assets and areas of strength/weakness within USC in light of the DoD feasibility and needs study for the UARC
         4. Identify, list, and evaluate current and potential energy centers of excellence nationally (competition)
         5. Identify, evaluate, and recruit partner programs that can fill in areas of weakness for USC

      ii. Fuel Cell Testing Facility:
         1. Identify key best practices for developing a research and testing facility
         2. Secure support from key USC leadership
         3. Determine current resource needs for industry and government clients
         4. Inventory current research assets available at USC
         5. Inventory current testing facility resources in U.S.
         6. Develop a business plan for fuel cell testing center
         7. Develop and market a sales package
         8. Align research and testing facility timeline into timeline for UARC

iii. Federal Research Award
1. Establish a regular federal opportunities dialogue with key fuel cell research teams at USC
2. Inventory historic, current, and future (target) fuel cell and energy research activities at USC to determine key areas of focus and existing programs to leverage
3. Focus on existing DoD fuel cell research within USC (DARPA)
4. Build an industry/university project team to submit a round II DARPA Fuel
5. Reformation commercialization proposal to DoD

5. Commercialization, Demonstration, and Infrastructure Projects

Goal: To improve the commercial environment to support hydrogen and fuel cell technology deployment through projects focused on growing demand for technology applications

a. **Key Outcomes:**
   i. Position Columbia, SC to secure (1) fuel cell forklift deployment in the next 24 months
   ii. Position the Columbia region for the deployment of fuel cell vehicle applications in 2015
   iii. Develop a cost effective solution to developing onsite hydrogen production to support transportation applications in the Columbia, SC region

b. **Strategies**
   i. Develop a list of priority forklift host sites
   ii. Identify and secure (3) potential forklift host sites for future deployments
   iii. Develop a list of current and future federal programs for fueling, transportation, and vehicle deployments
   iv. Complete a sales & marketing package to recruit fuel cell vehicle deployments in Columbia
   v. Recruit a project team to support fuel cell vehicle deployments in Columbia, SC
   vi. Develop a long-term usage plan for the Columbia fueling station
   vii. Develop a project plan and strategy for onsite hydrogen production capabilities
   viii. Develop a list of technology providers and viable solutions for onsite hydrogen production at the Columbia fueling station

Support Initiatives:

1. Collaboration Management & Stakeholder Engagement

Goal: Increase the management, manpower, stakeholders, partnerships and capital resources to fulfill the mission of the Fuel Cell Collaborative

a. **Key Outcomes**
   i. Expand management team of the collaborative to include key resource partners (i.e. Midlands Technical College)
   ii. Restructure current board of advisors to into an industry advisory group with key hydrogen, fuel cell, and energy companies as board members (as well as key economic development partners (ie: Greater Columbia Chamber)
   iii. Integrate the SCDOC into industry engagement activities
   iv. Build a cluster orientation model to focus activities on the needs of the industry
   v. Revise and assign roles and responsibilities for new and current members of the collaborative management team

vi. Secure additional sources of operating and project capital to accelerate economic development

b. **Strategies**
   i. Formally integrate Midlands Technical College (Tom Ledbetter) and Innovista (Ann Marie Steiritz) into the management team
   ii. Formally integrate Midlands Technical College into collaborative executive committee (Sonny White)
   iii. Establish a fuel cell collaborative cluster steering committee framework, meeting schedule, and program focused on fuel cell industry partners
   iv. Recruit (10) key private sector partners (ie: Trulite, Logan, WCSM, NextGenEn) onto cluster steering committee (including Columbia Chamber)
   v. Adopt new collaboration agreement with amended roles & responsibilities attachment
   vi. Secure $25,000 in additional working capital from the University of South Carolina to support collaborative projects
   vii. Secure $25,000 in additional working capital from new collaborative partners for projects

2. Marketing, Communications, & Outreach

Goal: Expand local, regional, and national recognition for the Columbia fuel cell industry through industry engagement, community outreach and web-based marketing.

a. **Outcomes**
   i. Give the collaborative a fresh look, feel, and message
   ii. Develop a new logo and tagline married to the current "elements" theme
   iii. Develop and use a recurring set of communications tools (social media, quarterly e-newsletter, and high impact annual report)
   iv. Establish a style guide to insure brand uniformity in future marketing efforts
   v. Integrate economic development tools into marketing and communications activities

b. **Strategies**
   i. Execute a brand, logo and tagline refreshment project for the FCC
   ii. Create a format and style guide to insure brand continuity for future
   iii. Develop and execute a new process and timeline for internal and external communications
   iv. Refresh value proposition and key message for target audiences (message block)
   v. Marry web, print, and other digital mediums into cohesive brand/look/feel
   vi. Develop new communications tools to engage internal and external stakeholders
   vii. Partner with the University of South Carolina to host a major clean energy university/ industry event in Columbia, SC
   viii. Develop a set of (4) case studies in support of fuel cell economic development

3. Government Affairs (KMLF)

Goal: Insure the Columbia, SC region and Collaborative partners are well positioned to take advantage of federal, state, and local funding and program opportunities in hydrogen and fuel cells

a. **Key Outcomes**
   i. Secure at least (1) federal fuel cell award jointly awarded to EngenuitySC, SCRA, USC, and/or MTC
   ii. Position Columbia to land (1) major federal research mission, facility, or program at the University of South Carolina

b. **Strategies**
   i. Continue communications with local and state legislative supporters

ii. Support development of new legislative initiatives aimed at growing the hydrogen and fuel cell economy in the region and the state
iii. Support federal funding requests for SCRA, USC, EngenuitySC, and MTC hydrogen and fuel cell projects
iv. Investigate and support federal funding opportunities for fuel cell projects
v. Work with SCRA/ATI to position Columbia for the Power and Energy UARC

5.6 Appendix F: Fuel Cell Collaborative FY13 Action Plan

USC-Columbia Fuel Cell Collaborative – Action Plan FY2013

Mission: The USC–City of Columbia Fuel Cell Collaborative is a consortium of organizations, including the University of South Carolina, the City of Columbia, EngenuitySC, SCRA, and Midlands Technical College, focused on positioning Columbia, S.C. as a leader in hydrogen fuel cell innovation and technology. Its mission is to attract private sector partners, top fuel cell scientists, entrepreneurs, and innovators to the Columbia region to help grow the innovation pipeline from discovery to development to deployment of fuel cell technology. For more information, visit www.fuelcellcollaborative.com.

Program of Work: The Fuel Cell Collaborative is dedicated to establishing Columbia, SC as a center of innovation in fuel cells through these overarching tactics:

- Research Development: Expand the depth, breadth, and quality of hydrogen, fuel cell, and future fuels research taking place in the Greater Columbia region.
- Entrepreneurship & Commercialization: Identify, commercialize and nurture new products and businesses stemming from discoveries made in hydrogen and fuel cells.
- Business Retention & Expansion: Support the retention and expansion of the existing hydrogen and fuel cell industry in the region through increasing competitiveness.
- New Industry Engagement: Identify, engage, and recruit active private sector partners into the Columbia region for landing parties, collaborations, and investment.
- Environment & Infrastructure: Improve the environment to support hydrogen and fuel cell technology deployment through projects focused on growing demand for technology applications
- Marketing & Communications: Raise awareness for the Columbia region as a world class destination for hydrogen and fuel cell technologies to attract private sector partners

The collaborative is seeking to fulfill its mission and goals through focusing on the key areas below over the next three years to foster discovery, development, and deployment.

Fuel Cell Collaborative Three Year Roadmap

Vision for 2015 (3 Years)	Year 1 Tactic (2013)	Year 2 Tactic (2014)
(Fuel Cell Challenge) Through the Challenge, develop a commercialization program focused on strategic partnerships, investor relations, and identifying industry-relevant emerging	Successfully complete the launch of Challenge V, enhance the connectivity between USC and the industry, and focus on using lessons learned to develop a better program for subsequent years.	Launch Fuel Cell Challenge IV, support development of previous Challenge winners through new partnerships, and integrate new tracks for faculty and SRNL involvement.

technologies at USC.		
Vision for 2015 (3 Years)	**Year 1 Tactic (2013)**	**Year 2 Tactic (2014)**
(Fueling Station) Through various partnerships and innovations, create inexpensive hydrogen that is portable, financially sustainable, and useful to the city and community.	Identify end users who need portable hydrogen and develop a mechanism for delivering it on-site. Work with the City of Columbia and Ford to use the existing ICE buses as a marketing tool and identify avenues for purchase.	Deploy portable hydrogen initiative and focus on getting technologies in place at the station that allow for the production of on-site hydrogen. Look for other strategic partnership opportunities to keep the station viable.
(Company Recruitment) Establish Columbia as a hub/destination for fuel cell research and development with ongoing supply chain mapping, academic and corporate research partnerships, and active company recruitment.	Seek projects for the Challenge that are natural overlaps for industry and research expertise. Work with SCHFCA to create a plan for utilizing the supply chain map and use that to begin targeting appropriate national and international industries.	Update supply chain map with any industry changes or growth. Work with Challenge participants to encourage extended research partnerships, including funding opportunities. Identify initial plans for annual fuel cell summit. Continue company outreach and recruitment.
(Cluster Growth) Establish a structure based on the cluster model that includes companies with products in the market, engages new industry partners, support growth in the Midlands, connects SRNL, and offers access to organizations who assist with commercialization.	Develop, sustain, and grow the Industry Advisory Board on a semi-annual basis, and offer networking opportunities, as well as identify support services needed. Engage companies who specialize in commercialization, like CETI and IdeaLab.	Maintain growth of IAB and networking opportunities, as well as implement the support services matrix. Promote active participation of commercialization partners. Use the launch of Challenge VI to engage appropriate individuals at SRNL to participate.
(Identify Expanded Applications for Fuel Cells) Support hydrogen and fuel cell technology deployment through strategic partnerships, expanded understanding	Identify appropriate groups to educate on uses of fuel cells, including forklift fleets. Research vendors who specialize in auxiliary power unit (APU) development and create a contact and engagement to recruit.	Continue outreach efforts to newly identified groups of potential users. Begin recruitment visits for APU vendor companies to discuss beta assistance, trial, and testing in Columbia. Determine best

of innovations and existing infrastructure, and targeted research, education, and recruitment.	Research SBIR awards.	use for ongoing SBIR research.
Vision for 2015 (3 Years)	**Year 1 Tactic (2013)**	**Year 2 Tactic (2014)**
(Federal Resources) Work with partners to secure energy-related federal research and development programs.	In conjunction with our research members, identify and apply for federal funding opportunities.	Secure new federal funds, and continue working with partners to look for other opportunities.
(Funding Opportunities) Seek new public and private funding partners and collaborative project opportunities.	Determine what our future cluster model will look like and how it will be financially sustained in the future.	Implement funding model with the Fuel Cell Collaborative team.
(Marketing and Communications) Refresh the brand and create a more effective sales, marketing, and communications platform.	Using the new name and tag line, develop a logo, refresh our marketing materials, presentation capabilities, and launch a new website.	Using new brand and marketing, lay the groundwork for company recruitment and/or attracting an industry trade show to the Columbia region.

5.7 Appendix G: Fuel Cell Challenge V Overview

Fuel Cell Challenge V - Overview

About The Fuel Cell Collaborative:
The USC–City of Columbia Fuel Cell Collaborative was formed by the University of South Carolina, the City of Columbia, EngenuitySC, SCRA to position Columbia, S.C., as a leader in hydrogen fuel cell innovation and technology. Its mission is to attract private sector partners, top fuel cell scientists, entrepreneurs, and innovators to the Columbia region to help grow an innovation pipeline from discovery to development to deployment of fuel cell technology. For more information, visit www.fuelcellcollaborative.com.

Project Background:
For more than five years, the USC-Columbia Fuel Cell Collaborative has managed an annual "Fuel Cell Challenge" competition with the goal of identifying and accelerating innovation and commercialization in hydrogen and fuel cell technology.

To date, the program has invested almost $5 million dollars in funding to support the discovery, development, and deployment of hydrogen and fuel cell technologies through more than 20 projects. The "challenge" program has helped to establish Columbia, SC as a top destination for hydrogen and fuel cell innovation; culminating in 2010 with South Carolina being recognized as a "Top Five Fuel Cell State" by Fuel Cells 2000. The challenge has helped to establish new companies, engage new companies, and advance the commercialization of fuel cell technologies through collaboration with industry partners from around the country. To date, the program has resulted in the following outcomes:

- (22) discovery, development or deployment projects
- (3) landing parties and (8) new startup companies formed
- (40+) new industry partnerships with fuel cell companies
- $10,000,000+ in capital investment in hydrogen and fuel cell technologies

V Theme - Investing in Innovation, Leveraging Talent:
This year, the theme for the Fuel Cell Challenge will be leveraging the world class research at USC to strengthen the innovation pipeline for hydrogen and fuel cell technologies and increase the competitiveness of existing hydrogen and fuel cell companies. The University of South Carolina is the fountainhead for innovation in hydrogen and fuel cells and one of the leading fuel cell research institutions in the U.S. In addition, the university boasts a diverse energy research program with activities in nuclear, hydrogen, fuel cells, photovoltaics, biomass, clean coal, and other energy sources.

1

Project Overview:
The University of South Carolina has a deep pool of both research and entrepreneurial talent that, when fused with industry needs, can solve real problems facing fuel cell companies while providing experiential learning opportunities for talented young students and faculty. In addition, by investing in innovation within university research, new discoveries, technologies, and business opportunities may be uncovered that can be commercialized.

University Teams:
The "challenge" will target interdisciplinary student teams at the undergraduate, graduate, PhD, and postdoctoral level. Where the business need requires an interdisciplinary approach, students will be encouraged to form teams that marry technical knowledge with business knowledge. Student teams will be targeted from the College of Engineering and Computing, The College of Arts and Sciences AND the Moore School of Business

General Timeframe:

Project Official Public Launch:	June 3, 2012 at WHEC
Industry Challenge Submissions Deadline:	June 29, 2012
Faculty Review/Selection of Challenges	July, 2012
FC Challenge Announcement for Student Teams	September 4, 2012
Student Team Submission Deadline Closes:	October 22, 2012
Review of Student Team Submissions:	October 24-26, 2012
Industry Notified if Challenge Selected	October 29, 2012
Student Teams Notified:	October 31, 2012
Challenge Awards Announced:	Nov 5, 2012 at Fuel Cell Seminar
Student Teams Begin Projects	January 2013
Mid-term Review Meeting:	March, 2013
Final Team Presentations/Pitches:	May, 2013
Fuel Cell Challenge Project Closes:	June, 2013

Key Project Partners:
- USC College of Engineering and Computing
- USC College of Arts & Sciences
- The Darla Moore School of Business
- Technology Commercialization - USC Office of the Vice President for Research
- The USC-Columbia Technology Incubator
- USC Innovista
- EngenuitySC
- SCRA/SC Launch

Project Goals:
- Identify new technologies to be further developed into commercially viable products
- Identify existing novel technologies and accelerate their transfer into the marketplace
- Increase collaboration between the University and the hydrogen and fuel cell community
- Advance the needs of the fuel cell industry through industry/university partnerships
- Strengthen the entrepreneurial support for clean energy research at the University
- Strengthen the culture of innovation and entrepreneurship at the University

Unique Elements:

The Fuel Cell Collaborative will establish a framework for connecting innovation to market-based applications that focuses on 1) challenging interdisciplinary teams of students to submit novel technologies or applications around hydrogen and fuel cells; 2) linking fuel cell companies to student teams to address real world challenges, 3) providing funded "challenge grants" to allow student teams to work actively on their innovation or industry project. Some key elements to the program are:

- **The Innovation Challenge**: designed to identify and pull out novel ideas, technologies, and applications around hydrogen and fuel cell technology at the University;
- **The Industry Challenge:** designed to leverage scientific, technological and business knowledge to solve problems presented by actual hydrogen and fuel cell companies in the industry;
- A focus on interdisciplinary teams comprised of both science, engineering, and business students to facilitate innovation.
- A systems level focus hydrogen and fuel cells to include a wider range of technologies and materials (ie: chemicals, membranes, catalysts, storage, stacks, entire systems, applications, etc.);
- "Fuel Cell Challenge Grants" of up to $25,000-$30,000 for up to (3) competitive teams of students;
- Industry/university interaction between fuel cell companies and student teams for learning exchanges and progress tracking;
- A faculty research adviser to help teams working on scientific or technical challenges;
- A faculty business adviser to help teams working on business challenges

Value Proposition:
This program is unique in that it will leverage the world class research talent at USC (faculty and students) and apply that talent to two areas of focus: 1) innovative projects or concepts from within and 2) industry derived technical, scientific or business challenges.

Measurements of Success:
The following are some key measures of success for the project

- # of new technology challenges addressed through FCC V contest
- # of new business concepts submitted through FCC V contest
- # of students teams participating in the FCC V contest
- # of new disclosures and patents filed through USC research
- # of new companies formed around USC research
- # of private and follow on capital secured as a result of program
- # of private sector partners engaged through the program

Support Required/Secured:
In order to make this competition a success, the Fuel Cell Collaborative will require the following resources and support from project partners

- $25,000 in funding through USC Innovista to support commercialization scholarships (business) - Secured
- $25,000 in funding through SCRA to support commercialization scholarships (business) - Secured

3

- $20,000 in funding through the University of South Carolina to support innovation scholarships (research) - Secured from VP of Research
- $12,500 per project in support from SC Launch's University Startup Assistance Program (USAP) for any companies that emerge from the project, contingent upon meeting the requirements for USAP and being approved by SC Launch Zone Manager - Requested of SCRA
- Research advisors for each student team focused on technical/scientific challenges - Requested of USC
- Business advisors for each student team focused on business challenges - Requested of Incubator and Moore School of Business
- Endorsement by Deans of the College of Engineering and Computing, the College of Arts and Sciences, and the Darla Moore School of Business to make the program a priority - Requested of Deans
- Endorsement by key research faculty in hydrogen, fuel cells and energy at the University of South Carolina to recruit students teams and raise awareness - Secured, with the assistance of Innovista
- Commitment to participate on an industry opportunities review committee with the Fuel Cell Challenge team by research and business faculty to help validate "challenges" that come in from the fuel cell business community - Secured

5.8 Appendix H: Fuel Cell Challenge Newsletters

11/28/12 Fuel Cell Challenge 2010 Awards Announced

Fuel Cell Collaborative October 2010

USC — CITY OF COLUMBIA FUEL CELL COLLABORATIVE

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FUEL CELL CHALLENGE PROJECT

This competition is a joint project of:

EngenuitySC, SCRA, SC Launch, the University of South Carolina, and the City of Columbia.

Fuel Cell Challenge 2010 Announces Winners

The Fuel Cell Collaborative officially announced two award winners for this year's Fuel Cell Challenge on October 20, 2010 at the Fuel Cell Seminar and Exposition in San Antonio, TX.

Weylchem Sustainable Materials took top honors for its proposal to produce low cost chemical compounds as a source for hydrogen generation utilized in fuel cells and other commercial applications.

First place winner Nab Aggarwal of Weylchem Sustainable Materials accepts his award.

A second prize was awarded to a proposed new venture called **Bio-Blu**, a synthetic fuel and fuel cell integration joint venture between Neutzler & Associates and researchers at the University of South Carolina, with support from Los Alamos National Labs.

"The Fuel Cell Challenge demonstrates on a global scale the Columbia region's level of commitment to cutting edge fuel cell and clean technologies," said Bill Mahoney, CEO of SCRA.

Both companies will be receiving access to startup capital, incubation resources and business planning support to take their innovative technologies out of the lab and into the marketplace in the Greater Columbia, South Carolina.

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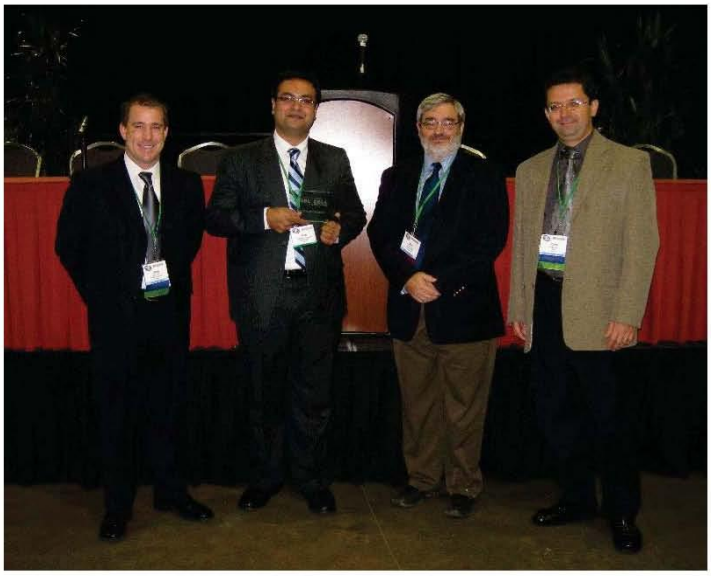

L to R: Greg Hilton, EngenuitySC; Nab Aggarwal, Weylchem Sustainable Materials; Bob Rose, US Fuel Cell Council and FCC judge; Radu Vitoc, SCRA.

"The competition is successful because we harness the power of innovative ideas and give them the support to develop into significant energy solutions," said Neil McLean, executive director of EngenuitySC.

Fuel Cell Challenge Info at Your Finger Tips

The Greater Columbia Fuel Cell Challenge was introduced in 2006, and has since gained national recognition by accelerating the commercialization of ideas and discoveries and providing a springboard from which pioneering technologies can be deployed.

About the Challenge
Submission Criteria
Panel of Judges

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Fuel Cell Collaborative Newsletter Summer 2011

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The USC-Columbia Fuel Cell Collaborative is a public/private sector initiative with the goal of positioning Columbia, SC as a world leader in fuel cell and alternative energy technology and applications. Our mission is to attract top fuel cell scientists, entrepreneurs, and private sector partners to help grow an innovation pipeline from discovery to development to deployment of fuel cell technology.

South Carolina Ranked Top 5 Fuel Cell State Again

LOGANEnergy Opens New Facility in Columbia

LOGANEnergy to Establish New Small Scale Power Division in Columbia

LOGANEnergy
The power of fuel cells.

The USC-Columbia Fuel Cell Collaborative is excited to announce a new addition to the fuel cell community in Columbia. LOGANEnergy, based out of Roswell, GA, is currently opening a brand new facility, LOGANEnergy Carolina, at the Midlands Tech Enterprise Campus.

The new venture will be housed in MTC's business accelerator bay providing the company with new facilities to assemble its power systems and stage its expansion of fuel cell services throughout the Southeast and Mid-Atlantic markets with small scale fuel cell solutions.

For more than 17 years LOGANEnergy has established itself as a world-leader of fuel cell solutions with 125 installations across the country and abroad with capacities ranging from 5kW to 600kW. In addition to its reputation and subject matter expertise, LOGANEnergy Carolina is expected to bring 15-25 new jobs to the Midstate region. The firm will join other industry leaders such as Trulite, Inc., which relocated to Columbia in 2009 to pursue manufacturing advanced portable power solutions, and strengthen an already robust atmosphere for fuel cell innovation in the Midstate region.

Initial activity at the facility will serve to support LOGANEnergy Carolina as it fulfills new demand created under its recent acquisition of a contract with the U.S. Army Corps of Engineers to deploy 18 fuel cell back-up power systems at eight different U.S. locations by the end of 2011. In addition, LOGANEnergy Carolina will develop two fuel cell power projects in the Columbia region to showcase the technology in real world applications.

Press coverage of the move has been extensive, including a front page

Fuel cell unit at USC's Carolina Stadium.

State of States Report Ranks SC Top 5 State Again

South Carolina again ranked as a top 5 state for excellence in the fuel cell industry. Along with California, Connecticut, Ohio, and New York, the report, published annually by *Fuel Cells 2000* describes South Carolina as a top five state for 2011 for its "numerous forklift demonstrations and deployments, hydrogen permitting leading to hydrogen fueling stations, [and] business development." The report noted Delaware, Florida, Hawaii, Maryland and Texas as "Up and Coming" states in the industry.

Brain Gain Opportunity

CAREER CENTER

Need Interns or Entry-level Employees with Science, Engineering, or Tech Backgrounds?

University of South Carolina will be hosting its annual Science, Engineering, and Technology (S.E.T.) Career Fair on Wednesday, September 28. Interested employers can register online or call the USC Career Center at 777-7280.

Hydrogen Fuel Cell Day

November 3rd at Fuel Cell Seminar & Exposition

For the first time, the Fuel Cell feature story on the cover of Columbia Regional Business Journal. The Collaborative is excited to host and support LOGANEnergy's continued success and hopes to build on the energy their firm brings to the industry in Columbia.

US Department of Defense to Expand Use of Fuel Cells

DoD to Install 18 Units Across 8 Bases

LOGANEnergy Fuel Cells at Fort Jackson

This past July, the Departments of Defense and Energy announced plans to expand use of fuel cells on 8 military installations. The fuel cells will provide emergency backup energy to protect critical services. Fort Bragg in North Carolina was selected as one of the 8 installations. South Carolina's Fort Jackson has already invested heavily in fuel cells, establishing itself as a leader in green energy in the military through a long-standing relationship with major provider LOGANEnergy.

"The shared vision of the Department of Energy and the Department of Defense for a safe, secure energy future provides us with a strong foundation to work together on specific technologies," said Energy Secretary Steven Chu. "Projects like these fuel cell systems will help reduce fossil fuel use and improve energy reliability at military installations across the country."

According to the DOE press release, fuel cells were preferred to other backup power options, including diesel generators, because they use no petroleum, are quieter, produce fewer pollutants and emissions, and typically require less maintenance. In addition to critical backup power applications, the military is pursuing fuel cells for distributed baseload power generation from fossil and renewable fuels; fuel cell-powered unmanned fuel cell vehicles for land, sea, and air; and portable soldier power. Organizations such as the Fuel Cell & Hydrogen Energy Association were quick to praise to move.

The eight DOD installations were chosen based on responses from a joint DOD-DOE project proposal request. LOGANEnergy of Roswell, Georgia will manage the project, using fuel cells from four manufacturers: ReliOn, Inc. of Spokane, Washington; Altergy Systems of Folsom, California; Idatech, LLC of Bend, Oregon; and Hydrogenics Corporation of Ontario, Canada.

The Department of Energy estimates the project will total about $6.6million of investment.

BMW to Use Landfill Gas to Power H2 Forklifts

Seminar & Exposition has expanded to include content and programming specifically covering hydrogen and hydrogen fuel cells. The expanded content includes a Hydrogen Fuel Cell Plenary Session beginning at 8:30 a.m. on November 3rd, followed by a number of technical presentations centered on the topic of Hydrogen Fuel Cells.

Around the Nation

Senator Chuck Schumer (D-NY) announced legislation to improve the tax credit for fuel cell-powered industrial vehicles, which will greatly benefit companies that build fuel cells designed for forklifts and other heavy machinery.

An existing tax credit provides significant incentives to buyers of fuel cells for cars and trucks and a separate credit for power generation, but neither credit specifically targets fuel cells designed for heavy machinery and off-highway vehicles.

BMW Methane Facility at Spartanburg Facility

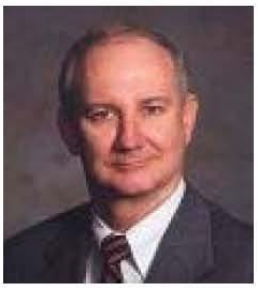
From *The Hydrogen Journal*

August 2, 2011 -- BMW has launched the first phase of work to validate economic and technical feasibility of converting landfill gas into hydrogen. This first phase is funded by South Carolina Research Authority.

Now the plan is to also use the methane to make hydrogen to directly power the forklifts. BMW has been using landfill gas since 2003, with methane being collected, cleaned, and compressed and providing over 50% of the plant's total energy requirements. $12m was invested in the program in 2009. It saves about $5 million in energy costs annually.

If future phases go ahead to actually implement the system, the project team will include BMW, Advanced Technology International (a subsidiary of SCRA), the Gas Technology Institute, Ameresco, Inc., and the South Carolina Hydrogen and Fuel Cell Alliance.
BMW is already using fuel cells to power nearly 100 material handling vehicles in a 1.2 million square foot assembly facility, where it produces the X3 Sports Activity Vehicle.

SC Renewable Energy Forum



Fred Humes - Director, Center for Hydrogen Research

Fuel Cells Make Premiere at Forum

Fuel cells made a premiere at this year's SC Renewable Energy Forum held Wednesday, July 27 at the Columbia Metropolitan Convention Center. Hosted by the SC Biomass Council, the SC Solar Council, the SC Clean Energy Association (Link unavailable), the Clemson University Restoration Institute, and the SC Hydrogen & Fuel Cell Alliance, the forum brought together a wide range of representatives from the industry. The USC-Columbia Fuel Cell Collaborative participated as a sponsor and exhibitor, extending its reach into both the public and potential stakeholders.

The Forum expanded on its previous format, which featured only solar, biomass, and wind energy, and added hydrogen and fuel cell entities respectively to its roster. Fred Humes of the Center for Hydrogen Research presented an impassioned speech during the morning calling for greater consideration for all renewable energies, specifically citing South Carolina's "extensive success in the hydrogen/fuel cell area and the recognition the state has received." Additionally, he highlighted Aiken County's work, including, the Center for Hydrogen Research, three hydrogen vehicles, the only industrial park in the US providing hydrogen to its tenants with a vehicle fueling station, 20kw of solar, two wind turbines, a representative of AIST [Japanese National Laboratory], and the 14 mile landfill gas pipeline to one of our industries. "We in the US are sorely lacking an energy policy that extends beyond politics and is not subject to changing administrations," he wrote after the conference.

Blair Hatcher, VP of Finance for Trulite, Inc., filled in during the afternoon on behalf of company President Ron Seftik. Moderator Elizabeth Colbert-Busch stated Seftik was missing for "exciting reasons." Hatch confirmed, stating Seftik was missing due to a potential new investment while promoting. Hatcher went on to promote Trulite's latest advances with their Hydrocell.

With 20+ sponsors, the forum drew a formidable crowd including a number of walk-ins. Event organizers state the conference sold out.

Upcoming Events

Thursday, August 11: Green Business Seminar, 9am-11:30am @ Lexington Health and Human Services, 1070 South Lake Drive, Lexington, SC 29073
Tuesday, September 13: Green is Good for Business Conference, 8am-6pm @ Columbia Convention Center
Wednesday, September 28: Science, Engineering, and Technology Career Fair, 12pm-4pm @ Columbia Convention Center
Tuesday, November 1-Thursday, November 3: Fuel Cell Seminar & Exposition @ Walt Disney World Swan & Dolphin Resort, Orlando, FL
November - TBA: Lexington County/City of Columbia Joint Green Business Seminar on Alternative Fuels and Fleet Efficiency. Details TBA.

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Join Fuel Cell Collaborative for Powering Your Community with Fuel Cells: The Role of Local Governments

engenuitySC™
Imagine More

When: Today at 2 p.m.

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USC — CITY OF COLUMBIA FUEL CELL COLLABORATIVE

How is Columbia leading in fuel cell technologies?

Over the past five years, the USC-City of Columbia Fuel Cell Collaborative, an innovative collaboration between the City of Columbia, the University of South Carolina, EngenuitySC, and SCRA created a vibrant "innovation pipeline" focused on fuel cell technologies.

Columbia and South Carolina have become leading examples of the discovery, development, and deployment of fuel cell technologies. Through successful collaborations, the USC-City of Columbia Fuel Cell Collaborative has propelled the Columbia region into the national industry spotlights, earned national and international recognition for technology-based economic development, and helped establish South Carolina as a "top five" state.

Why listen to the webinar?

On Thursday's Climate Communities webinar, join Russ Keller of SCRA, one of the USC-City of Columbia Fuel Cell Collaborative's charter members. He will provide an overview of how the Columbia community utilizes fuel cell technologies, and share best practices on how local governments can collaborate with the public and private sectors to achieve practical, achievable fuel cell successes through his experience with the USC-City of Columbia Fuel Cell Collaborative.

REGISTER to attend.

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Fuel Cell Collaborative October 31-November 4, 2011

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Join us at the 2011 Fuel Cell Seminar & Exposition

FUEL CELL SEMINAR & EXPOSITION

Come meet us in the SC Pavilion at the 2011 Fuel Cell Seminar & Exposition

3 Ways to Connect with Us:

1. **Visit us** at booth 417A in the SC Pavilion.
2. **Contact us** at info@fuelcellcollaborative.com with name, phone number, and when/where you would like to meet.
3. **Join us** at the Baker Awards Luncheon Tuesday, November 1 at 11:30am for a Special Announcement from the Collaborative.

The University of South Carolina-City of Columbia Fuel Cell Collaborative, a collaboration of the City of Columbia, the University of South Carolina, SCRA, EngenuitySC, and Midlands Technical College, travels to the 2011 Fuel Cell Seminar & Exposition in Orlando, Florida to represent Columbia's fuel cell economy from October 31-November 4.

Representatives will be on hand in booth 417A of the SC Pavilion to connect with the industry's top researchers, developers, and businesses leaders. Attendees can hear about the latest updates from the heart of South Carolina's burgeoning fuel cell economy and discover why their next fuel cell project should be in Columbia, SC.

The Collaborative will make a special announcement Tuesday morning at the 11:30am Baker Awards Luncheon regarding yet another exciting development in Columbia's fuel cell industry. The Fuel Cell Seminar &

Exposition will continue its program immediately following the announcement leading up to the 5pm opening of the exhibition hall. The Collaborative encourages all in attendance to make their way to the luncheon for the announcement.

The announcement will come on the heels of a number of successes for the Collaborative over the past few months. South Carolina was ranked as a top 5 fuel cell state for the second year running by Fuel Cells 2000 in June 2011, LOGANEnergy opened their Carolina headquarters in Columbia in July of 2011, and the Collaborative was recognized by the International Economic Development Council for Excellence in Economic Development in September 2011.

LOGANEnergy
The power of fuel cells.

If you would like to meet with representatives from the Collaborative to learn more about why you should discover, develop, and deploy your next project in Columbia, SC, contact Frank Avery at fjavery@fuelcellcollaborative.com.

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Columbia-based Trulite Powers Party for U.S. Energy Sec. Chu

Frank Avery, Fuel Cell Collaborative

Columbia-based Trulite, Inc., was featured at the U.S. Department of Energy's (DOE) annual holiday celebration. Energy Secretary Steven Chu was among the gathering of the department's leaders, staff, and guests. Using one of Trulite's mobile Hydrocell units, Trulite provided of a portion of the power for the decorations throughout the evening.

According to the DOE, "For the first time ever, the lights used to decorate the holiday tree were powered by a clean, efficient fuel cell."

Trulite Hydrocell at Energy Sec. Chu Holiday Party, Energy.gov

The holiday party represents one of the firms most public national successes. It is well known in the Columbia area as a leading fuel cell

to deployment of fuel cell technology.

solutions firm and represents one of the first firm's to join the burgeoning Columbia fuel cell community. The firm has recently joined up with Midlands Technical College to power various automated maintenance systems.

Read full coverage of the event at Energy.gov - http://energy.gov/articles/fuel-cell-powers-festivities-secretary-chu-s-holiday-party.

Upcoming Events

Wednesday, December 21: Fuel Cell Collaborative Executive Committee Meeting
Friday, December 23-Monday January 2: Fuel Cell Collaborative will be on holiday.
Tuesday, January 10: EngenuitySC presents Science Cafe . Capital City Club, 1201 Main St, Columbia, SC
February 5-February 9: 2012 International IEEE Electric Vehicle Conference, Greenville, SC
Wednesday, February 8, 2012: InnoVenture Forum, Columbia, SC
February 26-March 1: Materials Challenges in Alternative & Renewable Energy 2012, Clearwater, FL
February 29-March 2: FC Expo 2012, Tokyo Japan
May 1-2: Ohio Fuel Cell Symposium, Elyria, OH

FUEL CELL COLLABORATIVE PARTNERS

Forward email

USC — CITY OF COLUMBIA
FUEL CELL COLLABORATIVE

Have a *Challenge*? Bring it on...

What can the Challenge do for you?

Industry Q&A - Fuel Cell Challenge

Wednesday, June 27 - 11am EST

REGISTER

Are you working on a fuel cell project and want a funded team of students to create solutions to your biggest challenges? We're still taking Fuel Cell Challenge submissions from firms working with hydrogen and fuel cells. We'll take your Challenges and share with our students at the University of South Carolina. If your Challenge is selected by a winning student team, you'll have access to a student team funded with up to $25,000 to solve your Challenege by May 2013. Even if your Challenge isn't selected, you'll have a great opportunity to leverage new connections with our students' cutting-edge work at USC. Have questions? Attend our final Webinar to chat with the management staff.

University of South Carolina Researcher Accrues $25M for Fuel Cell Work

Steven Powell, Staff Writer, University of South Carolina

Ken Reifsnider's bachelor's degree in mathematics has helped drive the course of a professional career that began with a doctorate from Johns Hopkins in metallurgy and solid mechanics.

"For some years, I was heavier into the mechanical side of things," he said. "One reason is that I was looking for

mathematical rigor, and to be completely frank, for thirty years after I graduated there wasn't a great deal of it in the materials community. It was all about what kind of magic dust you could find this week, and what it could do."

With the development of better analytical methods, Reifsnider broadened his research beyond mechanics by preparing fuel cells for NASA in 1989. In 2008 he came to USC to create the Solid Oxide Fuel Cell program... Read on at the EngenuitySC Blog.

Around the South

Apple Launches Record-Breaking Fuel Cell Project
Charlotte, N.C. - Apple, Inc., creators of the infamous iPhone, iPad, and MacBook, launched the nation's largest private fuel cell project this past April when it filed with the N.C. Utilities Commission to install a 4.8 megawatt fuel cell at its Maiden, N.C. facility.

The project is particularly

SRNL Pioneers Path to Portability
Savannah River National Laboratory, based out of Aiken, S.C., has demonstrated a practical path to portable power systems based on alane and similar high capacity hydrogen storage materials that provide the sought-after high specific energy, which means the amount of energy per weight

Upcoming Events

10th European SOFC Forum: June 26-29 - Lucerne, Switzerland

S.C. Clean Energy Summit: July 18 - Columbia Metropolitan Convention Center

Green is Good for Business: September 18th - Columbia Metropolitan Convention Center

Fuel Cell Seminar & Exposition 2012: November 5-8 - Uncansville, CT

The project is particularly exciting as it is located in the heart of the Southeast, rather than California, which is often considered one of the states most heavily invested in fuel cell technologies. Last year, South Carolina ranked as a top five fuel cell state for its network of industry fuel cell applications.

amount of energy per weight.

Their accomplishments to date include developing a lower-cost method of producing alane, developing a method to dramatically increase the amount of hydrogen... Read on at phys.org.

Around the Nation

eBay to Trump Largest Fuel Cell Project

Not to be outdone by Cupertino-based Apple, Inc., online auction powerhouse eBay has announced plans this past week to trump Apple's 4.8 megawatt fuel cell project in Charlotte, N.C. eBay announced its intentions this past week to work with Bloom Energy to install a 6 megawatt project in its Utah data center.

According to reports, "Each of the 30 Bloom Energy cells making up the project (and running on biogas) will generate 1.75 million kilowatt hours (kWh) of electricity annually."

P&G Launches Fuel Cell Forklift Fleet

Hydrogen fuel cell forklifts continue to take over the market with news from Proctor & Gamble, owner of the Tide, Pampers and Gillette brands, that the firm will convert its battery-operated forklift fleets at three facilities to ones powered by hydrogen fuel cells.

South Carolina distirbution centers have already seen the value of fuel cell forklifts. Bridgestone Tire in Aiken and BMW Manufacturing Co. in Spartanburg have both already adopted the technology. New York-based Plug Power, which has Walmart, Sysco and Coca-Cola as customers, will supply P&G.

5.9 Appendix I: Fuel Cell Challenge Press Coverage

FEATURE

Economic development in the clean energy age: South Carolina

By Greg Hilton (Sagacious Partners LLC) and Radu Vitoc (SC Launch Program/SCRA), USC-Columbia Fuel Cell Collaborative, South Carolina, USA

There are significant challenges in the global battle for clean energy leadership, and more investment is needed in the discovery, development, and deployment of clean energy technologies. To prosper, regions need sound economic development strategies geared towards aggressively creating, nurturing, and embracing clean technology. This article looks at what South Carolina is doing to capitalize on a revolution in clean energy technologies.

The clean energy revolution

A revolution is quietly sweeping the world. Communities, countries, and the global economy are embracing the clean tech revolution. What's driving this revolution, and what are regions doing to capitalize on what some are calling the 'next evolution of energy'?

What's driving the clean energy revolution?

Now, more than ever, the focus on energy has taken center stage. Climate change, energy scarcity, and energy independence are forcing communities to aggressively seek new sources of energy and innovative technologies for using that energy. While the global economic downturn has dampened demand for energy, this will be a short-lived trend.

Whether you call them knowledge-based jobs, clean energy jobs, 'green' jobs, or any combination of the above, communities are investing heavily in clean energy and technologies as a driver of economic growth. According to a recent report, *Rising Tigers, Sleeping Giants*,[1] Asian countries are forecast to outspend the US on clean energy technology and infrastructure by a factor of 3:1 by 2013. China alone will be investing more than $600 billion in clean tech, compared to $172 billion by the US.

South Carolina and clean energy

With scarcely any naturally occurring energy resources, South Carolina has traditionally been a net importer of energy. Outside of nuclear energy, the state has no coal, natural gas, or other traditional energy resources to rely on. What is putting South Carolina on the map is its focus on developing new clean energy resources, and innovation of technologies to better utilize energy.

While South Carolina has had a strong history of fundamental and applied research in clean energy, there had been a dearth of companies involved in the energy revolution. That pattern is changing, through a focus on innovation and commercialization. A recent study from the Pew Charitable Trusts cites South Carolina as having more than 800 firms involved in clean energy.[2]

A short drive around this state of just over 4.5 million people reveals this pattern unfolding. Major investments in wind energy at places like General Electric in the Upstate region, and the recent Department of Energy (DOE) announcement of a $98 million investment in next-generation wind turbine research at the Clemson Restoration Institute in North Charleston,[3] demonstrate that you don't have to be able to produce wind energy to benefit from its growth.

Aiken – once the center for US nuclear weapons – is transforming its economy with nuclear energy research, hydrogen, and biomass activity.[4] In addition, South Carolina has become a focal point for the nuclear energy industry, with more than $40 billion worth of planned investment within a 100 mile (160 km) radius of the state capital, Columbia.

A fuel cell future

Ten years ago, no one in the clean tech industry would have pointed to Columbia as a center of innovation. But now the region is on the map in fuel cell technology, with significant research investments, commercialization activities, and leading fuel cell companies turning to 'The New Southern Hotspot' for clean energy.

How did this happen, what were the drivers, and what does it take to build a fuel cell economy of the future?

To answer these questions, a coalition of economic development organizations, higher education institutions, and private sector partners set out on a 12-month strategic planning process – entitled the South Carolina Next Energy Initiative[5] – to identify how the state could build an economic development strategy based on clean tech and fuel cells. The results of the 20-year plan focused on building an innovation pipeline consisting of discovery, development, and deployment resources to accelerate commercialization of fuel cell technology.

The SCRA Innovation Center at the University of South Carolina is one of three that aim to identify, nurture, and help grow high-impact, knowledge-based companies.

From this plan, two organizations were created: the **South Carolina Hydrogen & Fuel Cell Alliance**, and the **University of South Carolina-City of Columbia Fuel Cell Collaborative**. Particularly in Columbia, the region has a long history of energy-related research at the University of South Carolina, with the nation's only National Science Foundation (NSF) sponsored **Industry/University Cooperative Research Center for Fuel Cells**, and a strong history in nanotechnology and materials.

The Fuel Cell Collaborative: the building blocks for clean tech innovation

The foundation for the Fuel Cell Collaborative was laid through a strategic partnership among four organizations: EngenuitySC, a regional knowledge-based economic development initiative; SCRA, a powerhouse applied research and commercialization entity; the City of Columbia; and the University of South Carolina, a growing thought leader in fuel cells.

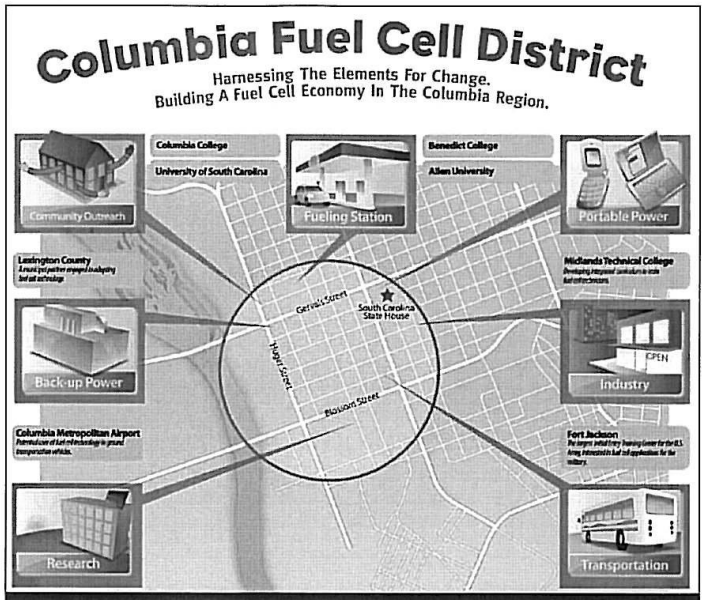
At the heart of the collaborative's strategy is leveraging the unique assets that each brings to the table, to create a world-class pipeline for discovery, development, and deployment. The vision was that by building a strong 'town and gown' relationship and bringing together key commercialization assets, the region would be able to build a pipeline linking research, commercialization, incubation, and existing industry together to drive economic growth.

This vision was aggressive, to say the least, as Columbia and the state of South Carolina did not have a single fuel cell related venture as late as 2003. But, by creating the right 'soil conditions' for clean tech growth, the region hoped to both create new businesses and engage external industry looking for a competitive place to do business.

The elements for a fuel cell economy: discovery, development, deployment

So, what does it take to build a robust innovation pipeline focused on fuel cells? Initiatives created in places like British Columbia, California, Ohio, and Connecticut come to mind. But, while the answer may seem simple, few regions have attempted this, and even fewer have done it successfully.

'A robust, knowledge-based economy consists of three key elements,' says Neil McLean, Executive Director for EngenuitySC. 'Discovery, development, and deployment.'



The Columbia Fuel Cell District was set up to support highly visible demonstration and market seeding projects within a concentrated area of the city.

Discovery: the role of research & innovation

To address the fundamental challenges facing the fuel cell industry, regions must concentrate on creating robust basic and applied research activities focused on breakthrough innovations that address clean energy technologies. Not only do these discoveries deal with basic and applied research needs, but they provide the fuel that drives the engine of economic innovation.

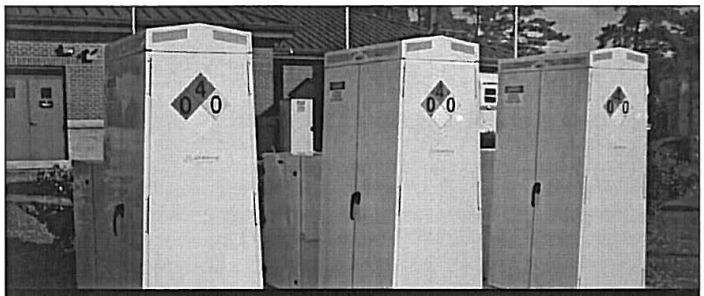
Companies – new and existing – require access to this research pipeline, to further their commercialization activities. The University of South Carolina (USC), as a leading institution in future fuels research, is investing heavily in creating an industry-leading research environment.

In 2004, USC was awarded the nation's only Industry/University Cooperative Research Center for Fuel Cells, sponsored by the National Science Foundation, and the race was on to develop a globally recognized center of excellence. This center is a place where industry members conduct cooperative research with USC scientists on an open platform.

'The university and its partners in Columbia and throughout the Midlands region have created an exciting environment where research, development, and demonstration of future fuels can take place,' remarks Dr Harris Pastides, President of the University of South Carolina. 'The industry/university cooperative research center at USC is the only one of its kind in the

Columbia is currently hosting the world's first hydrogen hybrid bus, manufactured by Proterra through a Federal Transit Administration grant.

FEATURE



SCRA/ATI's deployment of 10 backup power units at the Fort Jackson Army Base in Columbia is one of the largest stationary fuel cell military projects in the US.

US, and our Future Fuels™ initiative encompasses not only hydrogen research but also solar, wind, and nuclear research.'

Both the State of South Carolina and the University of South Carolina have invested heavily in attracting top research talent to the state through the **SC Centers of Economic Excellence** (CoEE) Program and the Innovista™ Research Campus, the region's boldest investment to date. The USC Solid Oxide Fuel Cell Center – led by Dr Ken Reifsnider, a leading SOFC scientist – is aiming to build one of the largest teams of SOFC scientists in the world. His team has just been awarded USC's single largest federal research grant ever, a $12.5 million DOE award for advanced energy research, and has partnered with more than 20 entities to further the discovery pipeline for clean energy.

Another prominent researcher, Dr Brian Benicewicz, was attracted to the region by its growing reputation. Benicewicz is one of the nation's leading researchers in polymer nanocomposites. But what makes researchers like Benicewicz unique is how they blend research and commercialization. He understands these ties, and has been able to connect discoveries his team is making to commercial applications in the industry. Recently, the group received more than $300 000 in research funding from BASF Fuel Cell Inc, for the development of next-generation high-temperature PEM fuel cell membranes.

With an investment of over $150 million, the University of South Carolina is taking on a vision to build an innovative destination for research and commercialization. Innovista™ is a downtown innovation and research campus that represents the physical manifestation of the university's long-time research philosophy of nurturing innovation, creativity, discovery, and opportunity. Signature research areas include hydrogen fuel cells and other clean energies, health sciences, nanotechnology, environmental sciences, and informatics. This unique proposition hopes to create a synergistic relationship between the public and private sectors that will fuel both research innovation and company formation in the Midlands region.

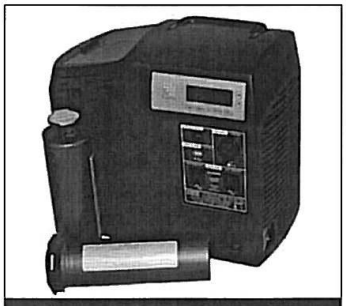
Development: a pipeline for commercialization

Knowledge creation is fundamental, but it is not enough. Taking knowledge and applying it to real-world needs is where the fuel cell industry has struggled historically by some accounts. This element involves creating an environment where commercialization is both encouraged and nurtured, and represents a critical component for next-generation economic development strategies.

You must have a dynamic entrepreneurial environment, and you must connect that environment to the discoveries and innovations flowing through your research institutions. Business incubation, access to much needed capital, and an environment that embraces 'failure without failing' is critical.

In early 2006, the Fuel Cell Collaborative launched a series of development projects aimed at building a critical mass of activities to foster innovation, company formation, and commercialization of fuel cell technology.

To rapidly stimulate industry partnerships and to build a fuel cell cluster in the Columbia region, the collaborative launched the **Greater Columbia Fuel Cell Challenge** and the **Columbia Fuel Cell District**, which were aimed at supporting highly visible demonstration and market seeding projects across all areas of the innovation pipeline within a concentrated area of the city. During the past five years more than 20 projects totaling over $3 million have been supported, ranging from fuel cell forklift demonstration projects, test deployments of portable backup power units, and 'lab to market' prototype fuel cells, to seed funding for relocation and new company formation in Columbia.



The City of Columbia has deployed and tested a dozen Trulite KH4 portable power units, to provide real-world utilization and data for the company's beta testing.

In addition, based on legislative direction from the South Carolina General Assembly, **SCRA** created three 'Innovation Centers' across the state, and chartered a new affiliate organization, **SC Launch**, to support their operation. The goal of this program is to identify, nurture, and help grow high-impact, knowledge-based companies. SC Launch provides qualified businesses and entrepreneurs, pre-company initiatives, and other knowledge economy initiatives with a mix of seed funding, access to venture capital, business mentoring, resources, and matching grants to support commercialization. The program received national recognition in 2008 by the State Science & Technology Institute (SSTI) for building entrepreneurial capacity.

'SCRA has enjoyed its lead facilitation role in working with business, academic, government, and economic development partners in Columbia and across South Carolina to advance alternative and sustainable energy commercialization,' says Bill Mahoney, CEO of SCRA. 'In less than four years, we have helped create dozens of demonstration projects and startups which are commercializing new energy technologies in SC.'

At the same time, the Columbia region began to focus on investing in the infrastructure to support commercialization, in particular via incubation. The city boasts one of the top-ranked technology incubators in the country, in the USC-Columbia Technology Incubator. Since 1998 the incubator has nurtured 51 companies, created 645 jobs, and has facilitated more than $29 million in follow-on investment capital. Five out of 50-plus companies currently in the incubator are looking to break into the hydrogen and fuel cell industry sector.

One of those companies, **NextGenEn**, was born through a collaboration between a local energy entrepreneur and one of the endowed chairs in fuel cells at the University of South Carolina. 'Columbia's collaborative environment and access to resources made this an easy choice for launching our clean energy company,' says Chad Sands, President and CEO of NextGenEn Inc. 'World-class research, a concentration of industry activity, and access to business resources are what drove our decision to begin here.'

And just recently, SCRA broke ground on an innovation center geared towards high-tech and light manufacturing startups. With an investment of $5.6 million in 2009, the center boasts over 74 000 square feet (6900 m^2) – room for 10–15 high-tech, light manufacturing startups – and close proximity to Innovista™, one of the boldest regional development projects to date.

In addition, the **Midlands Technical College** in Columbia is building an enterprise campus to support advanced manufacturing, and has created a fuel cell technician training program to build the workforce of the future in Columbia.

The USC-Columbia Fuel Cell Collaborative partnered with LiftOne and Hydrogenics to deploy two fuel cell powered forklifts in real-world operation in the region.

Deployment: bridging the gap

Being a world-class center for innovation drives activity. Equally as important, though, is creating an environment that embraces the commercial applications for clean technology. While it is not a precursor to economic success in clean tech, regions such as Columbia that have embraced sustainability and clean energy are able to create a supportive environment for new products (and companies) to be deployed.

In the past five years, the Fuel Cell Collaborative has partnered with private sector partners to build out the infrastructure to support clean technology. The state's first hydrogen fueling station was completed in early 2009, and the region is currently hosting the world's first hydrogen hybrid bus, manufactured by **Proterra** through a Federal Transit Administration grant.

SCRA, through its affiliate ATI, has collaborated with the US Departments of Energy and Defense on one of the largest stationary fuel cell military projects in the country, by deploying 10 backup power units at the Fort Jackson Army Base in Columbia. The City of Columbia, through a resolution, has committed funds to support the deployment of fuel cell technologies within the fuel cell district, and has recently completed a project with **Dantherm Power** to provide two backup fuel cell systems to supply emergency power to critical telecommunications systems in the region.

In addition, through a partnership with **Trulite**, the City of Columbia has deployed and tested a dozen KH4 portable power units, to provide critical real-world utilization and data for the company's beta test. A collaboration of public and private entities committed to partnering with Trulite to test the products in a range of settings and locations.

In another effort to help seed an early market adopter for fuel cells, the Fuel Cell Collaborative partnered with LiftOne and Hydrogenics to deploy two fuel cell powered forklifts that have operated in six real-world environments in the region. Collaboration with willing end-users was the key to success, with several major manufacturing and distribution partners testing the products. This widely successful project gained national recognition, and led to an award of $1.3 million in follow-on funding from DOE to expand the program to a national audience.

'We're finding in our preliminary tests that we can actually extend the life of a fuel cell over a conventional battery,' comments Bill Ryan, VP/General Manager of Lift One. 'And the bigger benefit there is, because it fuels like a conventional car would, you can go and refuel the fuel cell at any point in time.'

Delivering results in the knowledge economy

The combination of South Carolina's investments in discovery, development, and deployment have led to significant growth of the fuel cell industry in the region. In its first five years, the Fuel Cell Collaborative has partnered with more than 40 different public and private entities on research and commercialization projects.

An estimated $50 million in economic impact has been generated from these activities, with 10 new clean tech and fuel cell companies being created, spun out of the university, or recruited to the region. The Collaborative has deployed more than 20 projects in the local market that have helped companies test, demonstrate, and bring to market fuel cell technologies. The region is now one of the top destinations for US federal investments in fuel cell deployment.

This business-focused approach to economic development culminated in early 2009, when Columbia hosted the National Hydrogen Association's annual conference and expo. Through a collaboration with more than 10 local entities, the region attracted the conference to Columbia, and hosted over 2900 attendees from around the world.

In 2009, South Carolina was recognized as one of the top five destinations for hydrogen and fuel cell technology by the National Hydrogen Association, and the Fuel Cell Collaborative has been recognized for innovation in alternative energy economic development by the Southern Growth Policies Board.[6]

The region's focus on creating a compelling business environment for fuel cell companies is

Links

- **University of South Carolina-City of Columbia Fuel Cell Collaborative:** www.fuelcellcollaborative.com
- **Greater Columbia Fuel Cell Challenge:** www.fuelcellchallenge.com
- **EngenuitySC:** www.engenuitysc.com
- **SCRA:** www.scra.org
- **USC Industry/University Cooperative Research Center for Fuel Cells:** www.fuelcells.sc.edu
- **Columbia Fuel Cell District:** www.engenuitysc.com/initiatives/fuelcelldistrict.aspx
- **South Carolina Hydrogen & Fuel Cell Alliance:** www.schydrogen.org
- **SC Centers of Economic Excellence Program:** www.sccoee.org
- **SC Launch:** www.sclaunch.org
- **NextGenEn:** www.nextgenen.com
- **Midlands Technical College:** www.mtcenterprisecampus.com
- **Proterra:** www.proterra.com
- **Dantherm Power:** www.danthermpower.com
- **Trulite:** www.trulitetech.com

PATENTS

gaining momentum, with the recent announcement by Trulite to relocate its North American headquarters, R&D, and manufacturing to the region.[7]

What's next

The global battle for clean energy leadership is upon us, and the US faces significant challenges if it is to compete in the 'new energy era'. While much has been done, much more investment in the discovery, development, and deployment of clean energy technologies is needed. In addition, regions that want to prosper in the coming years will need sound economic development strategies geared towards aggressively creating, nurturing, and embracing clean technology to win this race.

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7. 'Fuel cell firm to build generators in Columbia'. TheState.com, 18 December 2009. Available online at www.thestate.com/2009/12/18/1076138/exclusive-fuel-cell-firm-to-build.html

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Or contact: Radu Vitoc, Technology Development Manager, SC Launch, 1330 Lady Street, Suite 505, Columbia, SC 29201, USA. Tel: +1 803 343 5302, Email: radu.vitoc@scra.org, Web: www.sclaunch.org

Patents

PEMFC system with means for air-purging water in anode loop

Assignee: **Honda Motor Co, Japan**
Inventors: K. Ueda et al.
Patent number: US 7597974
Published: 6 Oct. 2009 (Filed: 14 April 2005)

Automotive PEMFC operating algorithm to minimize RH cycles, improve durability

Assignee: **General Motors, USA**
Inventors: W.H. Pettit et al.
Patent number: US 7597975
Published: 6 Oct. 2009 (Filed: 15 May 2006)

Diagnostic method for automotive PEMFC, by measuring membrane crossover

Assignee: **Toyota Motor Corp., Japan**
Inventors: S. Hamada et al.
Patent number: US 7597977
Published: 6 Oct. 2009 (Filed: 16 Dec. 2003)

SOFC anode with ceramic-NiO composite powder network structure, and preparation

Assignees: **Hyundai Motor Co, Korea** *and* **Korea Inst. of Science & Tech., Korea**
Inventors: H.W. Lee et al.
Patent number: US 7597978
Published: 6 Oct. 2009 (Filed: 13 July 2005)

Structure of integrated packed DMFC without control box, for portable devices

Assignee: **Nan Ya Printed Circuit Board Corporation, Taiwan**
Inventors: Y.-Y. Liu et al.
Patent number: US 7597979
Published: 6 Oct. 2009 (Filed: 14 June 2005)

Sulfonic acid group-containing polymer, for DMFC membrane with low crossover

Assignee: **Fujitsu Ltd, Japan**
Inventors: N.F. Cooray et al.
Patent number: US 7597980
Published: 6 Oct. 2009 (Filed: 16 March 2005)

Composite membrane with nanoscopic dendrimers, for HTPEMFC (>100°C)

Assignee: **Hyundai Motor Co, Korea**
Inventors: J.H. Lee et al.
Patent number: US 7597981
Published: 6 Oct. 2009 (Filed: 30 Nov. 2005)

DMFC with gas supply pump applying negative electrode pressure, to prevent leakage

Assignee: **Toshiba, Japan**
Inventors: E. Sakaue et al.
Patent number: US 7597982
Published: 6 Oct. 2009 (Filed: 24 Sep. 2003)

Edge stress relief in diffusion media for PEMFC MEAs

Assignee: **General Motors, USA**
Inventors: Y.-H. Lai et al.
Patent number: US 7597983
Published: 6 Oct. 2009 (Filed: 25 Aug. 2004)

PEMFC bipolar plates with active areas separated by non-conductive frame header

Assignee: **General Motors, USA**
Inventors: J.N. Owens et al.
Patent number: US 7597984
Published: 6 Oct. 2009 (Filed: 24 Jan. 2005)

Austenitic stainless steel, corrosion-resistant conductive separator for PEMFC

Assignee: **Daido Steel Co Ltd, Japan**
Inventors: S. Takagi et al.
Patent number: US 7597987

Press Release
FOR IMMEDIATE RELEASE

South Carolina is named a "Top 5 Fuel Cell State" – AGAIN!

Columbia, SC (June 16, 2011) – South Carolina is named a Top 5 Fuel Cell State for the second year in a row. News of this honor came Tuesday with the release of Fuel Cell 2000's 2011 "State of the States: Fuel Cells in America" report.

The Top 5 states – South Carolina, California, Connecticut, New York, and Ohio – continued to reign supreme from 2010. South Carolina has become a major player in the hydrogen and fuel cell industry over the past few years and continues to grow and expand its efforts through education and outreach, infrastructure development, hydrogen research and development, fuel cell research and development, technology transfer and policy development.

"South Carolina is rife with opportunities for innovation, collaboration, and ultimately success," said Neil McLean, executive director for the USC Columbia-Fuel Cell Collaborative. "We are fortunate in Columbia to have a pioneering community of industry leaders, government officials, and researchers dedicated to creating a cutting-edge nexus of industry innovation. This honor continues to validate our state and community's work and prove hydrogen and fuel cells are the way of the future."

"Supportive state policies are helping foster fuel cell installations, company relocations and growth to help keep the U.S. at the forefront of fuel cell commercialization, despite competition from countries such as Japan, Korea and Germany," said Jennifer Gangi, program director for Fuel Cells 2000 and one of the authors of the (State of the States: Fuel Cells in America) report. "Continued federal and state support is crucial to moving the emerging fuel cell industry into full-fledged commercialization for a wide variety of applications and power needs."

South Carolina's positive initiatives towards aiding in the expansion of the hydrogen and fuel cell industries have become a leader and model for other states to follow. The report noted Delaware, Florida, Hawaii, Maryland and Texas as "Up and Coming" states to watch.

"We are pleased to again be honored with this top recognition as a leader in the industry," said Shannon Baxter-Clemmons, Ph. D., executive director for the South Carolina Hydrogen and Fuel Cell Alliance. "South Carolina is well positioned to accept the continued growth of the hydrogen and fuel cell industry. Currently, South Carolina is the only state to uniformly permit hydrogen and fuel cells at the state level while using internationally recognized codes and standards and is home to two hydrogen fueling stations (located in Columbia and Graniteville).

South Carolina Hydrogen and Fuel Cell Alliance
1225 Laurel Street, Suite 428 Columbia, South Carolina 29201
Phone: 803-545-0189 • Fax: 803-545-0190 • www.schydrogen.org

These efforts will aid in safe, effective and efficient adoption and commercialization of hydrogen and fuel cells - which is good news since most major automotive companies are slated to begin mass commercialization of their fuel cell vehicles by 2015."

To view the full "State of the States: Fuel Cells in America" report, please go to http://www.fuelcells.org/statereport.html.

About the South Carolina Hydrogen and Fuel Cell Alliance (SCHFCA)
The South Carolina Hydrogen and Fuel Cell Alliance is a non-profit public-private partnership of academic, government and business coordinating resources in South Carolina to advance the commercialization of hydrogen and fuel cells. For more information about the SCHFCA, please visit http://schydrogen.org/ or call 803-545-0189.

About the USC-Fuel Cell Collaborative
The University of South Carolina – City of Columbia Fuel Cell Collaborative was formed by the University of South Carolina, the City of Columbia, EngenuitySC and SCRA to position Columbia, SC as a leader in hydrogen and fuel cell innovation and technology. For more information regarding the Fuel Cell Collaborative, contact Frank Avery at (803) 354-5714, fjavery@engenuitysc.com or visit www.fuelcellcollaborative.com.

For further inquiries, please contact:

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LOOKING TO THE FUTURE BY DEVELOPING SC'S HYDROGEN FUEL CELL ECONOMY

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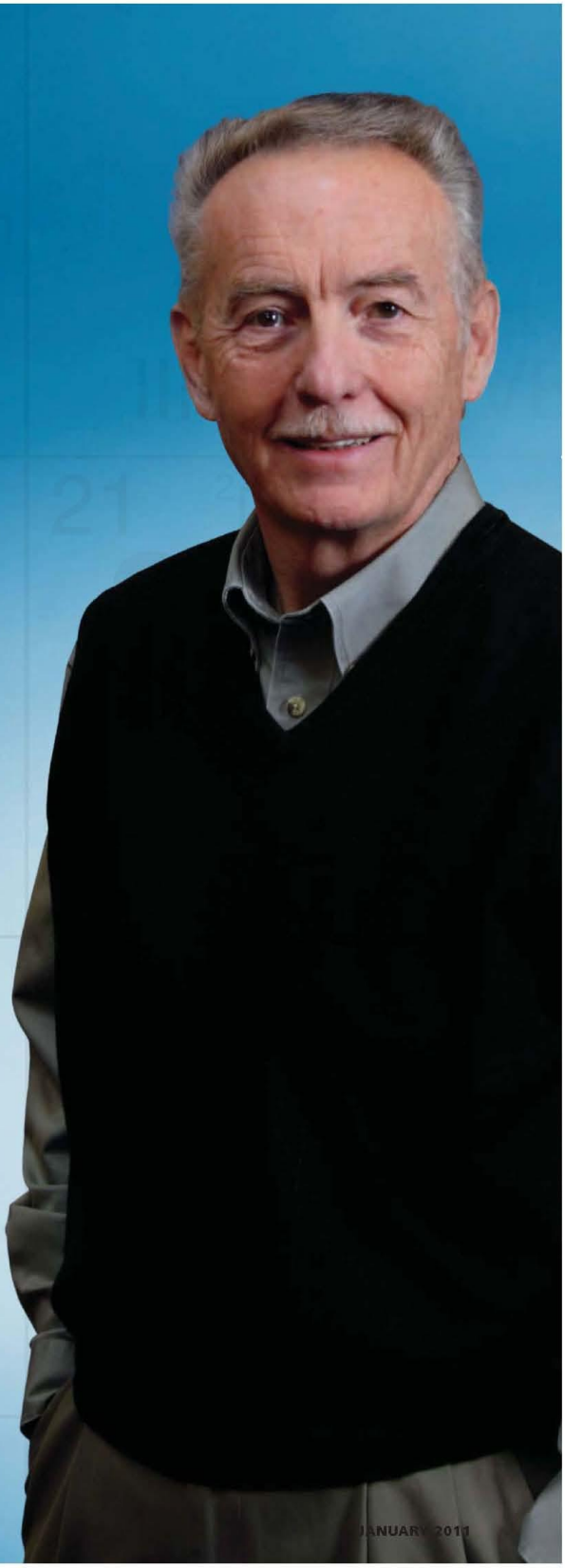
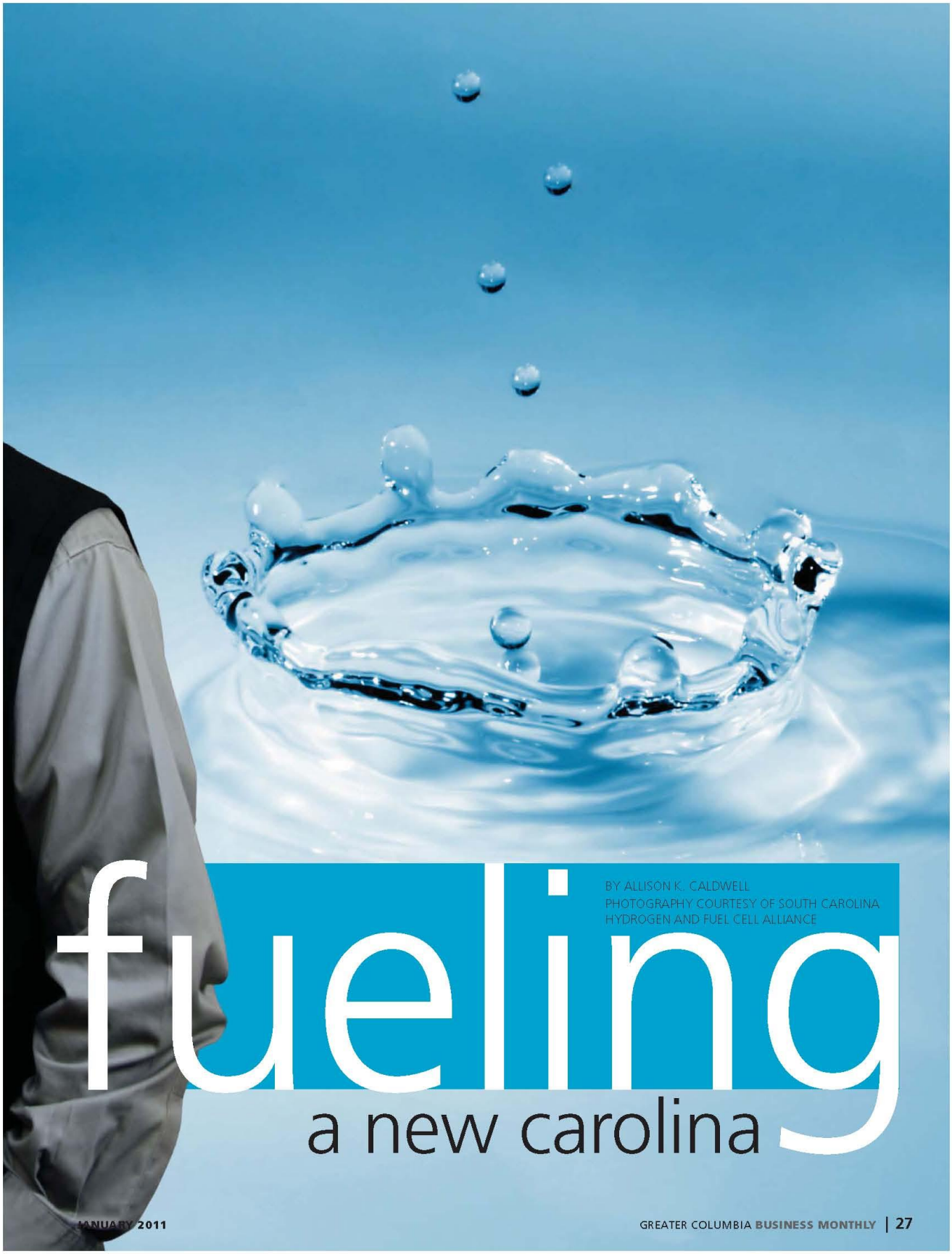
When it comes to alternative energy sources, fuel cells are about as clean as they come. Unlike traditional, nonrenewable fossil fuel technologies that use coal and oil and generate pollutants in the form of carbon emissions and greenhouse gases, hydrogen fuel cells produce only water vapor, electricity and heat. At a time when it seems the whole world is going green, fuel cells and their numerous applications offer clean energy options that are much more efficient, kinder to the environment and could eventually decrease and even eliminate U.S. dependence on foreign oil.

As national and global interest in fuel cells continues to grow, South Carolina — and the Midlands in particular — continues to evolve as one of the premier sources of groundbreaking research and technology. In 2010, South Carolina was named one of the Top 5 Fuel Cell States (along with California, Connecticut, New York and Ohio) by Fuel Cells 2000, a non-profit outreach organization that promotes the commercialization of fuel cells and hydrogen. Columbia made headlines worldwide as host of the National Hydrogen Association Conference in 2009, and in recent years has developed an aggressive, collaborative approach to becoming a major player in the clean tech revolution.

"Five years ago, no one in the clean tech industry would have pointed to Columbia as a center of innovation, but now we're giving juggernauts like Ohio and Connecticut something to think about," says Greg Hilton, senior project manager with EngenuitySC and team member in the USC-Columbia Fuel Cell Collaborative.

"USC's recent announcement of a $12.5 million Energy Frontier Research Center, several prominent recruits through the Endowed Chairs program and a host of fuel cell and clean energy start ups have confirmed the university's leadership in Future Fuels," says Hilton. "We're only five years into a 20-year strategic plan to grow the fuel cell innovation pipeline in Columbia, but we've already come such a long way."




fueling
a new carolina
BY ALLISON K. CALDWELL
PHOTOGRAPHY COURTESY OF SOUTH CAROLINA HYDROGEN AND FUEL CELL ALLIANCE
JANUARY 2011
GREATER COLUMBIA BUSINESS MONTHLY | 27

USC AND INNOVISTA: ROCK STAR RESEARCHERS AND HIGH-TECH DEVELOPMENT

In building a knowledge-based economic cluster around hydrogen and fuel cells, the University of South Carolina plays a vital role as a hub of world-class research and development. From its Future Fuels™ program to the nation's first National Science Foundation-sponsored research center for fuel cells, USC is home to some of the brightest minds and most significant breakthroughs in the industry today. Dr. Ken Reifsnider is the Center of Economic Excellence (CoEE) Endowed Chair in Solid Oxide Fuel Cells and director of the university's Solid Oxide Fuel Cell programs.

"I came to USC in the fall of 2007, and was tasked with putting together a research team for the SOFC Center of Economic Excellence," says Reifsnider. "Since that time, we have hired five more tenure track faculty, two research faculty and added students and post docs to bring our group to about 40. We have also attracted over $15 million in competitive funding for research and education. Helping an organization of this size work well and prosper is a significant task."

"As a scientist, I'm committed to developing energy conversion technologies that allow our country to be strong and free. We need to be able to use our energy resources effectively and efficiently," says Reifsnider. "Those resources include biomass from our fields and forests, wind and solar resources, and fossil fuels that can be converted into useful forms without threatening our health. High temperature fuel cells — often called Solid Oxide Fuel Cells or SOFCs — can do all of those things better than any technology we have at present, but not yet on the scale or at the cost needed by our country." According to Reifsnider, SOFCs are one of the most rapidly growing technologies in portable power.

"Power and charge packs that make a cell phone run for a month, a laptop that operates for weeks, and remotely-powered communications devices and vehicles that operate for very long periods of time are a present reality and part of a new future for our society," says Reifsnider. "Auxiliary power units for trucks are being deployed, and experimental units are operating in airplanes. These units use fuels as diverse as our resources, from diesel fuel, to propane, to hydrogen from many sources. Our research group is building a small SOFC-powered car that never goes to the filling station for fuel.

> "WE HAVE THE OPPORTUNITY TO PLAY A MAJOR ROLE IN CREATING THE BRIGHT, INDEPENDENT, SUSTAINABLE FUTURE WE ALL WANT."

"What excites me most about USC's energy science and technology program is that the personnel, facilities and especially the culture, provide one of the best opportunities for creating and delivering the next generation of energy conversion technologies. This is one of the most important problems of our times, and we have the opportunity to play a major role in creating the bright, independent, sustainable future we all want."

Also an internationally-known scientist, researcher and fuel cell expert, Dr. Brian Benicewicz joined the faculty in 2008 as an Educational Foundation Distinguished Professor in the Department of Chemistry and Biochemistry and CoEE Endowed Chair in Polymer Nanocomposite Research. With a new lab housed in the recently completed Horizon I building in the Innovista research district, Benicewicz leads a research group investigating new polymers for high temperature fuel cell membranes (among other projects).

"The polymer membrane is considered the 'heart' of a polymer electrolyte membrane (PEM) fuel cell, and represents a central challenge for the future of fuel cell devices," says Benicewicz. "Nobody has yet come up with a membrane that can operate at higher temperatures and perform well for any period of time, but we're making progress. USC has set the research infrastructure in place and attracted the right people for an excellent research environment. There aren't many universities that have thought it through this well."

Although not without its challenges in leadership, funding and development, USC's Innovista research district has been crucial not only in recruiting some of the nation's top researchers, but also in attracting "knowledge-based economy" companies and the jobs that come with them. Retired pharmaceutical executive Don Herriott became director of Innovista Partnerships almost a year ago, charged with improving public perception of the plan.

"A lot of people think Innovista is about buildings, but it's more about an area in the Midlands that is vibrant, a good place to live and has high quality jobs. Innovista is an economic development strategy, and a critical component is having a major university as a driving force. Well-known success stories of high-tech economic powerhouses like Silicon Valley, Austin, Texas, Boston route 128 or Research Triangle Park were all fueled by top tier research universities," says Herriott. "USC is one of 61 top tier Carnegie 1 Research intensive universities in the U.S. — universities that have spawned high-impact companies like Google, Apple, Genentech, Facebook, Dell Computers and many others. None of these regions have overnight success stories.

"Silicon Valley's Stanford Research Park and Research Triangle Park were both formed in the late 50s, but took at least a decade to start building momentum and a generation before they were deemed as important economic engines. If we understand the timeframe to transform economic foundations, then our rate of progress is actually quite good, and significant progress is being made. Companies are being formed, jobs are being created and our research strength continues to grow." For 2011, Herriott has proposed a two-pronged strategic plan for Innovista.

"First of all, we want to grow our own high-impact companies and jobs here by providing a great support network for talented entrepreneurs. The challenge will be to take a less fragmented approach, increase funding options and provide a one-stop service for entrepreneurs to get help, resources or just some guidance," says Herriott. "The second prong will be to make it easier for businesses to connect to USC's remarkable resources including equipment, research capabilities, student interns and faculty projects. This can be done to increase competitiveness of existing local companies or in concert with recruiting companies to relocate.

"Innovista does and will increase our area's wealth, attract creative people and drive our economy to new heights. It will provide jobs in these areas of interest, allowing our best and brightest to stay in South Carolina. Its research is world class and targeted at major global needs. Growth in service and hospitality businesses can be expected as well. As Mayor Coble used to say, Innovista is a game changer and we need only to remember that the game is a marathon, not a sprint."

PUBLIC/PRIVATE PARTNERSHIPS — THE KEYS TO SUCCESS

Several public/private partnerships help support and promote fuel cell research and development in the Midlands and throughout the state. Two such groups are the USC-Columbia Fuel Cell Collaborative and the South Carolina Hydrogen

NOTABLE PROJECTS IN THE MIDLANDS

The USC-Columbia Fuel Cell Collaborative and partners continue to invest in the development, deployment and testing of new fuel cell applications to provide a nurturing environment for these technologies to proliferate. Notable recent projects include:

Fort Jackson Stationary Fuel Cell Power Project (2009). Funded by the U.S. Department of Energy Market Transformation Program and the U.S. Army Corps of Engineers and managed by Advanced Technology International, this project deployed 10 backup power units into mission-critical applications at Fort Jackson to stimulate early adopters of market-ready technologies into Federal government facilities and agencies.

The Hydrogen Hybrid Bus (2008). Built by Proterra and a consortium of suppliers, Columbia was the first market to test and host the 100 percent green-field bus as part of a $5 million National Fuel Cell Bus Program. Part of the U.S. FTA-funded Fuel Cell Bus Program and managed by the Center for Transportation and the Environment in Atlanta, the project featured a real-world demo and field test by the CMRTA and USC.

LiftOne-Hydrogenics Fuel Cell Forklift Demo Project (2008). Funded by the Fuel Cell Challenge, this project supported the deployment of two fuel cell-powered forklifts to six regional warehouse and distribution facilities to support the early adoption of market-ready technologies. As a result, the U.S. DOE provided additional funding for LiftOne to take the program to a national audience. South Carolina has since become an early market adoption leader for fuel cell forklifts with companies like BMW, GenCo, Bridgestone/Firestone and others making strategic investments.

Columbia Hydrogen Fueling Station. This public/private project launched the first hydrogen fueling station in the state and only one of a handful in the southeast. Announced during the National Hydrogen Association's (NHA) Expo and Conference hosted in Columbia, the project placed South Carolina as one of only 10 states with hydrogen fueling infrastructure.

NHA 2009. City and state leaders lured this conference to Columbia, which yielded more than 2,500 attendees from 22 countries, more than 50 exhibitors and 1,000 public day participants with an estimated economic impact of $1.4 million. The conference was critical in advancing economic development efforts for several alternative energy deals in the state such Proterra, Trulite and others.

Others: USC Baseball Scoreboard Fuel Cell Project (2010); Dantherm-City of Columbia Telecom Backup Project (2009); Midlands Tech Fuel Cell Technician Training Program (2008); Trulite Pilot Manufacturing Project (2008); SCETV Fuel Cell Camera Power Packs (2007);

Compiled by Greg Hilton, Engenuity SC

and Fuel Cell Alliance, each committed to attracting private sector partners, top fuel cell scientists, entrepreneurs and innovators to South Carolina.

Formed in 2006 and comprised of representatives from USC, the City of Columbia, SCRA and EngenuitySC, the Fuel Cell Collaborative is strategically focused on positioning Columbia as home of the first integrated Fuel Cell District in the country, as well as a global model for the mass deployment of fuel cell applications and technology.

"Columbia is the ideal city for the first planned end-to-end Fuel Cell District because of its existing research strengths at USC, the focus and collaboration of the region's political, business and academic leaders and ample resources to implement this vision," says Hilton.

"With concerns over energy security, climate change and the next generation of economic development opportunities, clean technology investment has skyrocketed across the globe and is revolutionizing the global energy economy. The Collaborative has identified specialized niches in fuel cell applications, from mobile power for forklifts, buses and segways, to health services, to providing long-lasting portable power for soldiers in the field."

Collaborative partner EngenuitySC, a public/private partnership focused on developing and growing Columbia's knowledge-based economy, was awarded a $3.6 million grant in October from the Defense Advanced Research Projects Agency (DARPA — the research and development office for the Department of Defense) to support research and commercialization of the next generation of fuel flexible fuel cells for portable applications. The Collaborative also hosts the nationally recognized Fuel Cell Challenge, where competitors submit innovative technologies and business plans for developing the next generation of hydrogen and fuel cell-based products. Teams from three continents competed in 2010.

SCRA, an emerging global leader in applied research and commercialization, has also been a pivotal partner. A public 501(c)3 based in South Carolina, SCRA currently manages more than 100 national and international programs worth over $1.3 billion in applied research and development (R&D) contract value. Hilton says the company not only provides capital for Midlands-based projects, but is also a key resource in attracting Federal dollars and programs into the state.

"SCRA has been a leading facilitator of the clean tech revolution in South Carolina, from fuel cells to biomass to clean transportation," says Neil McLean, Executive Director for EngenuitySC.

While Collaborative members focus primarily on Columbia, the South Carolina Hydrogen and Fuel Cell Alliance seeks to promote hydrogen and fuel cell development on a statewide level. Also founded in 2006, Alliance members include not only USC but Clemson University, South Carolina State and the S.C. Technical College System, as well as key research and business partners like the Savannah River National Laboratory, the S.C. Department of Commerce, the S.C. Energy Office and several others.

Dr. Shannon Baxter-Clemmons, a Lowcountry native with a Ph.D. in Chemical Engineering from USC, worked in hydrogen and fuel cell operations from California to Washington, D.C. before returning to South Carolina as Executive Director. The Alliance was recently awarded a $100,000 grant from the U.S. Commerce Department's Economic Development Administration to develop an economic development strategy for the South Carolina hydrogen and fuel cell cluster, to include the mapping of the hydrogen and fuel cell supply chain.

"Hydrogen and fuel cells have the potential to revolutionize the way the world views, produces and uses energy. South Carolina has become a national and international leader in this area, and that reputation is attracting companies looking to relocate or expand their services here. The driving force is our public-private partnerships," says Baxter-Clemmons.

"Through direct state appropriations and support of the Centers of Economic Excellence program, the Palmetto State has invested over $12 million in hydrogen over the past five years. This has spurred well over $115 million in non-state investments; a conservative estimate considering much of the private investment is deemed proprietary. That means South Carolina is leveraging its hydrogen investment dollars at a rate of at least 10 to one. With all the expertise in South Carolina, we have the ability to shift our nation's energy focus to one that is locally produced and capitalizes on existing assets."

"Success in the future is better jobs and more of them — after all, that is what an economic development strategy is supposed to deliver," says Herriott. "My vision of success, perhaps not in a decade but within a generation, is that Innovista is home to a Fortune 500 born, bred and headquartered in the Midlands of South Carolina."

"At this point, the future is a matter of choice for us," says Reifsnider. "The technology to secure our energy future is here — we need only to add our commitment and dedication to that task." GCBM

LEARN MORE

To learn more about the science, technology, development and economic impact of hydrogen fuel cells in South Carolina, visit these resources:

USC — City of Columbia Fuel Cell Collaborative
www.FuelCellCollaborative.com

SC Hydrogen and Fuel Cell Alliance
www.SCHydrogen.org

EngenuitySC
www.EngenuitySC.com

SCRA
www.SCRA.org

The State
South Carolina's Homepage™

Posted on Thu, Mar. 03, 2011

USC wants to use hydrogen-powered bus

Plan would provide transportation for disabled students

By ADAM BEAM
abeam@thestate.com

The University of South Carolina wants to use a hydrogen-fuel-cell-powered bus to shuttle disabled students around campus for one year, as part of the university's commitment to convert all of the school's fleet to alternative fueled vehicles by 2015.

A partnership for the plan, which has yet to be finalized, is between Ford, the owner of the bus; USC, which would provide the driver and the insurance; Columbia City Council, which would provide the fuel; and the federal Department of Energy, which would help pay for the lease.

The partnership, if it is successful, ensures the city will have someone use its $1.2 million hydrogen fueling station in the Vista. And it will continue to build Columbia's reputation as a place where car companies can test their new alternative fuel vehicles, said Greg Hilton, senior project manager for EngenuitySC, a public-private partnership that encourages technology research in Columbia.

The Ford Hydrogen V-10 E-450 Shuttle. The fuel cell hybrid bus was on display,Wednesday at City Hall for viewing while Mayor Steve Benjamin along with representatives from each partnering organization presented it and explained the significance of fuel cell technology and its impact on our economy.

- Kim Kim Foster-Tobin/kkfoster@th /The State

City and university officials, along with folks at the South Carolina Research Authority, were on hand Wednesday morning to show off the bus, along with a hydrogen-powered Honda FCX Clarity, which was visiting the city for one day.

"This initiative today ... is about more than just a demonstration," Columbia Mayor Steve Benjamin said. "It's about utilizing new technologies and finding new ways to make transportation — whether it's a public bus or the car in your garage — cleaner, more efficient and more affordable."

Columbia and USC have invested millions in hydrogen fuel cell research, with the goal of its becoming the future of transportation and establishing the capital city as a hydrogen hub. That commitment was in jeopardy in 2009, when the Obama administration proposed cutting in half federal money for hydrogen research, telling Congress he believed taxpayer money was better spent researching electric cars. But Congress later restored the money, and Obama approved it.

"All the car companies ... are saying this will be the future, and they are continuing their private investment in the technology," Hilton said. "This (referring to USC's partnership for the shuttle bus) is now about public adoption and getting people comfortable with the technology."

USC's shuttle service transports about 5,000 students every day, according to Derrick Huggins, the university's director of vehicle management and parking services. Last year, the shuttle's green route featured a hydrogen-powered bus. It's all part of the university's Genesis Project, designed to convert all of the school's fleet to alternative fuel vehicles by 2015.

"It will effectively eliminate 2,000 tons of carbon dioxide being emitted into the atmosphere every year by our vehicles," said Michael Koman, USC's sustainability director.

That's good for the city's efforts to reduce its ground ozone, which is generated mostly by vehicle emissions. Right now, the Midlands ozone levels are just below the federal standard. But the Environmental Protection Agency is considering lowering the standard, a move which could put the Columbia area out of compliance and potentially cost the area millions of dollars in federal grant money and mean harsher restrictions on businesses.

Reach Beam at (803) 386-7038.

For Immediate Release: 02/02/2012

Contact: Emily Brady
Emily.Brady@chernoffnewman.com, 803.233.2452

Midlands Technical College Formally Joins USC-Columbia Fuel Cell Collaborative
College Brings Expertise in Workforce Training to Grow Midlands' Fuel Cell Economy

Columbia, S.C. – (February 2, 2012) – Today Midlands Technical College (MTC) announces that it will join the USC-City of Columbia Fuel Cell Collaborative, a collaboration of SCRA, EngenuitySC, the University of South Carolina and the City of Columbia, to position Columbia, S.C., as a leader for fuel cell innovation and technology. Dr. Sonny White, MTC President, will join the Collaborative's executive committee, and Tom Ledbetter, executive director for MTC's Enterprise Campus, will join the Collaborative's management team to advise operations.

MTC has actively participated with the Fuel Cell Collaborative's efforts in building Columbia's fuel cell economy since its inception in 2006. In August 2008, MTC hosted the Hydrogen Road Tour, a public event that featured ten hydrogen vehicles as part of a cross-country trek of clean, efficient hydrogen vehicles. And in 2009, MTC worked with the Collaborative as a partner of the National Hydrogen Association's Hydrogen Conference and Expo held in Columbia, S.C., and showcased some of its fuel cell programs.

Currently, MTC houses two fuel cell solutions firms within its state-of-the-art business accelerator located at the MTC Enterprise Campus in northeast Columbia. LOGANEnergy, a leading fuel cell solutions firm, opened its newest mobile power systems facility in June 2011, LOGANEnergy Carolina. Trulite, Inc., relocated to Columbia, S.C., in 2009 and is currently the only fuel cell company to offer both fuel cell and fuel source in one fully integrated system. Trulite recently made national industry news when its Trulite Hydrocell was selected by the U.S. Department of Energy to power the tree at its annual holiday party. MTC also uses Trulite products to power its irrigation system on campus.

"Midlands Technical College is proud to officially become a partner of the USC-Columbia Fuel Cell Collaborative after years of supporting its mission and furthering the fuel cell economy in the Midlands," said Dr. Sonny White, President of MTC. "We look forward to bringing the industry and workforce training expertise we have gained from having two fuel cell firms at our facilities to the Collaborative and further enhancing Columbia's reputation as a global leader of fuel cell solutions."

In addition to the businesses growing at MTC's Business Accelerator, the college also has two full-scale labs devoted to the design and fabrication of fuel cell technology and has also pioneered two new training programs, including: the Principles of Alternate Energy Certificate

program, addressing the fundamentals of fuel cells and other alternative energy sources; and the Mechanical Engineering Technology Associate Degree. Successful graduates of both programs will be qualified to enter the workforce as medium-level operators, laboratory technicians or senior manufacturing technicians.

"The addition of MTC to the USC-City of Columbia Fuel Cell Collaborative strengthens our group and furthers our reputation as the leading force behind Columbia's fuel cell economy," said Bill Mahoney, CEO of SCRA, one of the Collaborative's original charter members. "MTC's training expertise will help the Collaborative represent all facets of the fuel cell industry - from research to development to deployment in the field."

MTC joins the Collaborative as it prepares to launch the next iteration of its Greater Columbia Fuel Cell Challenge, an award-winning business-plan competition designed to support the commercialization of innovative fuel cell technologies. The 2010 winner, WeylChem Sustainable Materials, is working on a pilot project producing ammonia borane, a multi-purpose compound that can be used to efficiently power fuel cell devices among other commercial uses, at its facility in Elgin, S.C. The Collaborative will release final contest details for the 2012 Challenge by the end of March.

About Midlands Technical College
Midlands Technical College is a comprehensive, multi-campus, public, two-year college serving the primary region of Richland, Lexington and Fairfield counties of South Carolina. The college enrolls approximately 18,000 credit students annually, and provides continuing education to 30,000 individuals and hundreds of area businesses each year. MTC is the largest provider of transfer students to the University of South Carolina. www.midlandstech.edu.

About the USC-City of Columbia Fuel Cell Collaborative
The USC–City of Columbia Fuel Cell Collaborative was formed by the University of South Carolina, the City of Columbia, EngenuitySC and SCRA, to position Columbia, S.C., as a leader in hydrogen fuel cell innovation and technology. Its mission is to attract private sector partners, top fuel cell scientists, entrepreneurs, and innovators to the Columbia region to help grow an innovation pipeline from discovery to development to deployment of fuel cell technology. For more information, visit www.fuelcellcollaborative.com.

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Press Release
FOR IMMEDIATE RELEASE

South Carolina Continues to Lead in New *State of the State: Fuel Cells in America* report

Columbia, SC (October 3, 2012) – South Carolina is named a "Top 5 State" for the third consecutive year as outlined in the recent release of Fuel Cell 2000's, *State of the States: Fuel Cells in America 2012*, September report.

New for this year, the *State of the States: Fuel Cells in America* report is broken down into categories. South Carolina is named a "Top 5 State" in the following categories: Fuel Cell Forklifts (Deployed or Ordered), Hydrogen Fueling Stations, and Successful Fuel Cell Policies.

"I am proud to represent a state that is leading the nation in the innovation of hydrogen fuel cells," boasted Congressman James E. Clyburn (D- SC). "This alternative energy source is going to be critical to our country's future energy policies and the creation of homegrown, American-owned jobs. Fuel cells are already providing less bulky, more reliable energy for military communications devices; are contributing to the efficiency of numerous manufacturing facilities; and one day could heat and power our homes. I was pleased to bring Secretary Chu to see the research being done by the South Carolina Fuel Cell Alliance, and to have played a role in helping the Department of Energy include fuel cell as part of their future research initiatives."

South Carolina is a national leader in the hydrogen and fuel cell industries and continues to grow and expand its efforts through education and outreach, infrastructure development, hydrogen research and development, fuel cell research and development, technology transfer and policy development. South Carolina is the only state to uniformly permit hydrogen and fuel cells at the state level while using internationally recognized codes and standards [H. 3835] and is home to two hydrogen fueling stations [located in Columbia and Graniteville]. Companies, such as BMW, GENCO Kimberly-Clark, and Bridgestone, have all implemented fuel cell forklifts in their SC-based warehouses, which enables reductions in productivity costs and increases available space and tax benefits (see also "Hydrogen and Fuel Cells: Lift Trucks, A Practical Application").

"South Carolina's fuel cell economy thrives from bringing innovations to the marketplace through effective partnerships between universities, private organizations and the public sector," said Bill Mahoney, SCRA CEO and Executive Committee member for the Columbia, S.C.-based Fuel Cell Collaborative. "SCRA's partnership with BMW to develop renewable sources of hydrogen to

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power forklifts at their Upstate facility and our continued involvement with the University of South Carolina, the City of Columbia, EngenuitySC and Midlands Technical College in the Fuel Cell Collaborative are just two examples of our work in the fuel cell industry. We are delighted to be recognized at the national level for our thought leadership, and we look forward to continue making the state a leader in the alternative energy arena."

"We are pleased to again be honored with this top recognition as a leader in the industry," said Dr. Shannon Baxter-Clemmons, Executive Director of the South Carolina Hydrogen and Fuel Cell Alliance. "Adoptability of hydrogen and fuel cell technologies is becoming cost effective in several markets. Domestic energy production, such as natural gas, is helping bridge the gap for fuel cell's commercial viability and creation of national energy security."

To view the full *State of the States: Fuel Cells in America 2012* report, please go to http://www.fuelcells.org/wp-content/uploads/2012/08/StateoftheStates2012.pdf.

About the South Carolina Hydrogen and Fuel Cell Alliance (SCHFCA)
The South Carolina Hydrogen and Fuel Cell Alliance is a non-profit public-private partnership of academic, government and business coordinating resources in South Carolina to advance the commercialization of hydrogen and fuel cells. For more information about the SCHFCA, please visit http://schydrogen.org/ or call 803-545-0189.

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About Fuel Cells 2000
Fuel Cells 2000's mission is to promote the commercialization of fuel cells and hydrogen by supplying accurate, unbiased industry information and developing and disseminating summary materials accessible to a general audience. Fuel Cells 2000 is independent and non-aligned, and supports fuel cells of all types for all applications. For more information, please visit http://www.fuelcells.org/.

For further inquiries, please contact:

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USC-COLUMBIA FUEL CELL COLLABORATIVE ANNOUNCES $75,000 FUEL CELL CHALLENGE

Student Teams Compete for Startup Funds to Solve Industry Submitted Challenges and Commercialize New Technology

Toronto, Canada - (June 05, 2012) – This week at the 2012 World Hydrogen Energy Conference in Toronto, Canada, the University of South Carolina-City of Columbia Fuel Cell Collaborative launched their fifth Fuel Cell Challenge. Started in 2006, the purpose of this year's Challenge is to engage interdisciplinary student teams from the University of South Carolina to compete for $75,000 in seed funding through two contests: the Industry Challenge, where students will create solutions for industry proposed problems; or the Innovation Challenge, where students can submit business plans to commercialize new hydrogen and fuel cell technologies.

Different from years past, the Fuel Cell Collaborative is putting an exciting new spin on this year's Challenge. In addition to focusing on technology commercialization, the Collaborative is expanding the scope by recruiting businesses around the globe to submit real-world "challenges" that are technical, business-related, or industry-wide. A panel of experts will identify the most appropriate industry submissions, and interdisciplinary teams of students from USC will have two options: select an Industry Challenge and work to develop a proposed solution; or propose their own business plan through the Innovation Challenge to commercialize new technology. These proposals will then be reviewed by the same expert panel and scored separately based on: composition of team, technical approach, innovative approach, commercial viability, and financial viability.

The highest scoring student teams will each receive a portion of the $75,000 to put their plans into action. Funds will be awarded in November 2012, and final amounts will be determined based on team budget and the number of viable submissions. The student teams will have six months to work closely with industry partners and faculty advisers, and final products will be presented to the expert panel and industry representatives in May 2013.

"This is an exciting opportunity for our students to engage in real-world problem solving with businesses across the globe, take new ideas to market and contribute to the growth of an industry poised to reshape the delivery of clean energy," said Harris Pastides, president of the University of South Carolina. "The University of South Carolina and the Fuel Cell Collaborative share a belief in the power of ideas and innovation. With our cutting edge fuel cell research center and nationally recognized business programs, USC is proud to educate leaders in the energy economy."

To date, the Fuel Cell Collaborative - through both the Challenge and more than 20 different partnerships - has allocated almost $5 million in funding to help establish new companies, commercialize new technologies, and advance the innovation pipeline for the hydrogen and fuel cell industries in South Carolina.

The deadline for industry submissions to the Challenge is June 29, 2012, by 5:00 p.m. Visit www.fuelcellcollaborative.com/challenge and click on "Apply" for submission forms and instructions. For more information about the Fuel Cell Collaborative and how you can apply, please visit www.fuelcellcollaborative.com.

1

About the USC Columbia Fuel Cell Collaborative

The USC–City of Columbia Fuel Cell Collaborative was formed by the University of South Carolina, the City of Columbia, EngenuitySC, SCRA, and Midlands Technical College to position Columbia, S.C., as a leader in hydrogen and fuel cell innovation and technology. Its mission is to attract private sector partners, top fuel cell scientists, entrepreneurs, and innovators to the Columbia region to help grow an innovation pipeline from discovery to development to deployment of hydrogen and fuel cell technologies. For more information, visit www.fuelcellcollaborative.com.

###

5.10 Appendix J: Fuel Cell Collaborative Conference Presentations

The Fuel Cell Challenge

Accelerating Clean Tech Innovation

Fuel Cell and Hydrogen Energy Conference
Washington, DC
02/15/11

COLUMBIA A Capital Place To Be | UNIVERSITY OF SOUTH CAROLINA | SCRA Collaborating To Advance Technology | engenuity SC

Columbia, SC:
Who is the Fuel Cell Collaborative?

USC — CITY OF COLUMBIA
FUEL CELL COLLABORATIVE

SCRA
Collaborating To Advance Technology

engenuity SC
Building a bridge to the next economy in South Carolina.

CITY of COLUMBIA, S.C.
JUSTITIA VIRTUTUM REGINA

UNIVERSITY OF SOUTH CAROLINA

The Fuel Cell Collaborative
The Innovation Pipeline

Investing in innovation by recruiting top fuel cell research talent, investing in world class infrastructure, and establishing leadership in future fuels research

Accelerating commercialization and development through applied research, industry collaborations, incubation, proof of concept and seed funding

Establishing a test bed for the deployment of fuel cell technologies to support emerging companies through demo projects, product testing, and public/private investments in early market adoption

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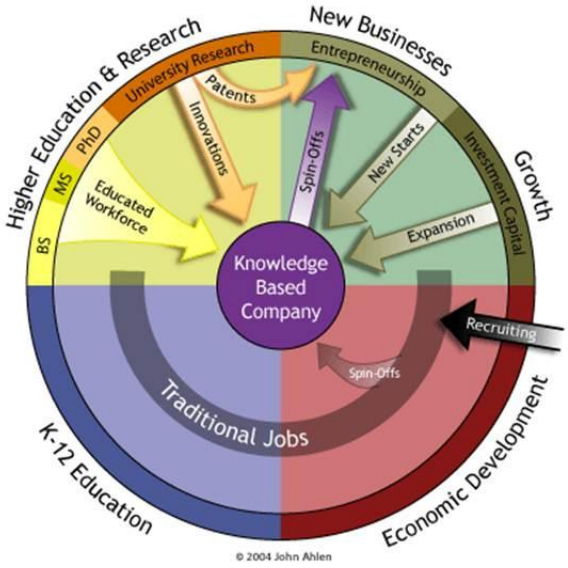
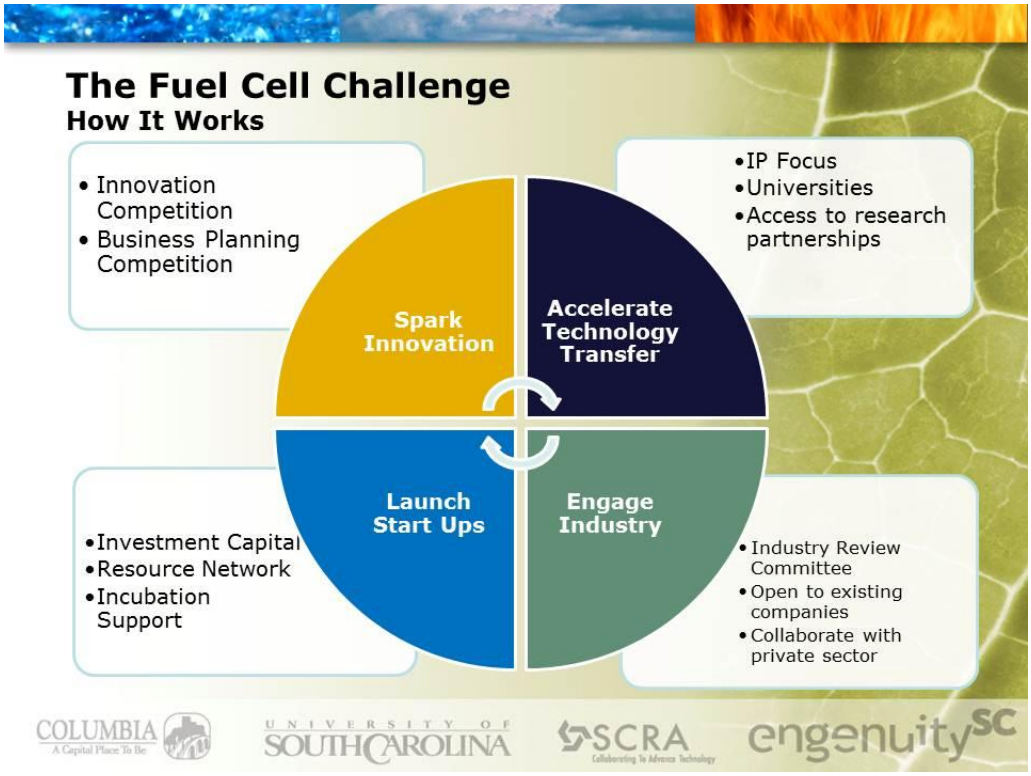
The Fuel Cell Innovation
The End Game





Fuel Cell Challenge Launchpad:
From Innovation to Commercialization

trulite
Clean, reliable power – anywhere.

H_2M HYDROGEN HYBRID MOBILITY

palmetto
FUEL CELL TECHNOLOGIES LLC

BoroScience
INTERNATIONAL

DEnergy,Inc.

NEXTGENEN
Empowering life through clean energy

GreenWayEnergy™
POWERFUL EXPERTS

palmetto
FUEL CELL ANALYSIS & DESIGN LLC

WEYLCHEM

BIO-Blu

Hydrogen & Fuel Cell Milestones:
Discovery, Development, and Deployment Projects

FUEL CELL CHALLENGE

- Benedict College Backup Fuel Cell Project
- Citizens School for H2 & FC Technology
- SCETV Fuel Cell Cameras
- USC Fuel Cell Powered Segway Project
- Boroscience Commercial Pilot Production
- MTC Fuel Cell Training Facility & Program
- Trulite KH4 Beta Test Bed Project
- City of Columbia-Dantherm Telecom Backup Power Project
- LiftOne-Hydrogenics Fork Lift Demo Project
- USC-DOE-NASA Solid Oxide Fuel Cell Demo
- USC Fuel Cell Scoreboard Power Project
- Trulite Pilot Manufacturing Facility Project
- Fort Jackson-DOE Stationary Fuel Cell Power Project
- USC Solid Oxide Fuel Cell Project
- FTA Hybrid Fuel Cell Bus Project
- Columbia Hydrogen Fueling Station

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Historical Clean Technology VC Investment By Year North America, Europe & Israel, China, India	
2003	$1,258,565,762
2004	$1,398,256,823
2005	$2,077,524,074
2006	$4,520,208,949
2007	$6,087,179,844
2008	$8,414,259,610
2009	$5,600,000,000
2010	$7,800,000,000


Clean Tech Highlights in 2010
Ripped from the Headlines
• Record Number of Clean Technology Venture Investment Deals in 2010 – CleanTech Group
• GE Announces $200 Million Open Innovation Challenge Seeking Electric Grid Breakthroughs – Clean Edge
• DOE Announces $75 million Fuel Cell Technology Program – U.S. DOE
• Massive Clean Energy Stimulus Bill within Extended Bush-Era Tax Cuts – Clean Technica
• Wall Street Journal Announces Top 10 Cleantech Companies – WSJ
• Bloom Energy Raises $400 million for "Bloom Box" – GreenTech Media
• China Surges Ahead on Clean Energy Investment – Financial Times
COLUMBIA
UNIVERSITY OF SOUTH CAROLINA
SCRA
engenuity SC


The Clean Energy Revolution:
Why Is the World Focused on This?
• Market Opportunity: Global demand for clean tech (including fuel cells) projected at $2.6 trillion in 2021.
• Creation of High-Paying Jobs: New energy will yield high-paying, high-quality jobs and a next generation skills portfolio.
• Dividends for Regions that Move First: Young market that will have high demand and high returns for the next 50 years
• Leading the Innovation Economy: Those that invest in research, innovation, and commercialization NOW will likely control industry value chain in future.
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Lessons Learned in Clean Tech Innovation

Strategies to "Innovate" to a Clean Energy Economy

1. It takes a village to raise a child
2. Marrying technology and business savvy
3. Market Orientation – Step in your customer's shoes
4. Innovation – A constant focus and it shouldn't just happen in the lab
5. Forget the $100M investment
6. Honor thy commitments

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Lessons Learned in Clean Tech Innovation

It Take a Village to Raise A Child

The Role of Public/Private Collaboration

Startups Need more than Just Capital

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Lessons Learned in Clean Tech Innovation

Technology + Business Talent = Success

Marrying innovation, technology, and good ole' fashioned business expertise

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Lessons Learned in Clean Tech Innovation

Market Orientation…Please

…now and forever

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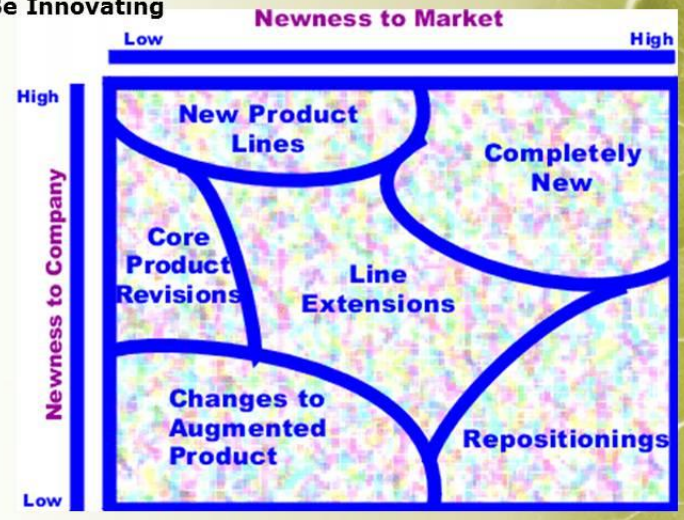
Lessons Learned in Clean Tech Innovation

Always Be Innovating



…and why it should not be limited to the lab

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Lessons Learned in Clean Tech Innovation

Expect Delays Ahead

Cultivate multiple sources of capital

COLUMBIA A Capital Place To Be | UNIVERSITY OF SOUTH CAROLINA | SCRA Collaborating To Advance Technology | engenuity SC


Lessons Learned in Clean Tech Innovation
The Role of Research in the Innovation Economy
SOUTH CAROLINA
CEE
innovista
UNIVERSITY OF SOUTH CAROLINA
SCRA
collaboration innovation commercialization
UNIVERSITY OF
SOUTH
CAROLINA
NSF
SRNL
SAVANNAH RIVER NATIONAL LABORATORY
U.S. DEPARTMENT OF
ENERGY
HeteroFoaM™ - EFRC


Lessons Learned in Clean Tech Innovation
Investing in Innovation and Commercialization
COLUMBIA
A Capital Place To Be
UNIVERSITY OF
SOUTH CAROLINA
SCRA
engenuity SC


GREATER COLUMBIA
FUEL CELL
COLLABORATIVE
Blazing the trail for Hydrogen & Fuel Cells
COLUMBIA SC
FAMOUSLY HOT
NHA Conference and Hydrogen Expo
March 30 - April 3, 2009 • Columbia, SC
COLUMBIA
A Capital Place To Be
UNIVERSITY OF SOUTH CAROLINA
SCRA
engenuity SC

Appendix K: Fuel Cell Challenge Publicity

www.plicards.com

1

605 Sweeten Creek Industrial Park
Asheville, NC 28803
Phone: (800) 752-1017
Fax: (866) 773-0500 or (828) 418-8203

FINAL PROOF LAYOUT
MCNABB MARKETING RESOURCES
10-10-12 641601

FRONT

Background: Recycled Stock
Text/Logo: 4 Color Process
Finish: Gloss
Thickness: 30 Mil
Size: 2.125" x 3.375"

HEAD

---------- Fold on dotted line to view front to back orientation. ----------

HEAD

BACK

Background: Recycled Stock
Text/Logo: Black
Finish: Gloss
Mag Stripe: LOW
POS / Lock System: TIM
Qty: 800

LPG

THIS IS A COMPUTER GENERATED PROOF. COLOR APPROXIMATES FINAL PRINTED PRODUCT.

- Final Quantity: The nature of printing necessitates slight overruns or underruns. However, we will not ship more or less than 10% of order quantity. Our billing reflects the actual quantity shipped. If you desire exact quantities, quoted prices will have to be reviewed and additional charges may be applicable.
- Exact PMS color matches cannot be guaranteed. We will come as close as possible to match the PMS colors selected; certain ink colors vary after lamination or when printed on colored stock.
- Check Mag Stripe (if applicable) for size and position.
- Check spelling, positioning and location of hole punch, die cut and signature panels.
- Plasticard-Locktech International reserves the right to use all products in our advertising and displays unless otherwise specified in writing at the time of order.

Please check the appropriate box below, sign and date the proof, and return.

* **NOTE: A final signed proof establishes full responsibility by the signer, including assuming any liability resulting from any actions brought against us for copyright infringements.**

By indicating "Proof O.K. Proceed with order." job will then proceed into production. If a proof needs to be corrected, indicate appropriate box. A revised proof will follow, additional charges may apply.

Fax return okay.

Plasticard-Locktech Int. assumes no liability for designs and logos that do not meet corporate or brand standard requirements. A signed proof establishes full responsibility by the signer and asserts that the signer has the legal right to use any marks and/or logos. Plasticard-Locktech Int. recommends brand standards be confirmed before signing final proof.

ONE BOX MUST BE CHECKED:

❑ Proof O.K. Proceed with order.
❑ Make noted revision and reproof.
(Additional charges may apply.)

Production will continue when proof is returned.

Signature

Date

Proof must be signed and appropriate box checked before production will begin.


WHAT CAN THE CHALLENGE DO FOR YOU?
The USC-City of Columbia Fuel Cell Collaborative launches its signature FUEL CELL CHALLENGE. The Challenge is for students and industry professionals alike to submit problems and create solutions to accelerate innovation and commercialization of hydrogen and fuel cell technologies. To date, the program has invested nearly $5 million in funding to support the discovery, development, and deployment of more than 20 projects.
USC STUDENTS:
Student teams can compete to win startup funding by forming an interdisciplinary team, securing a faculty advisor, and competing in...
INNOVATION CHALLENGE:
Submit an innovative concept to commercialize hydrogen and fuel cell technologies.
or
INDUSTRY CHALLENGE:
Submit a solution that addresses an existing industry challenge and gain real world experience with established firms in a high tech, alternative energy market.
INDUSTRY PROFESSIONALS:
Submit a challenge your company would like addressed and have an interdisciplinary team of University of South Carolina students, with guidance from faculty and your firm, solve it.
WHAT DO I GET?
INDUSTRY: Opportunity to outsource a new or recurring technical, business, or communications challenge to the world-class students and faculty at the University of South Carolina. Your problem will be addressed from every angle to create a well-rounded, viable solution giving your firm an edge over competitors.
STUDENTS: Secure startup funding and develop new relationships at the University and in the industry to launch a startup firm around a new or existing hydrogen or fuel cell technology.
OR: Lead a project to develop a solution to a real world problem for existing industry firms and establish your value and potential as a leader in alternative energy.
Industry Challenge Submissions Due
JUNE 29
Student Submission Period
OCTOBER 22
Winning Student Teams Announced
NOVEMBER 5
JOIN THE COLLABORATIVE FOR THIS AMAZING OPPORTUNITY.
For questions and contest details, visit www.fuelcellcollaborative.com.
USC — CITY OF COLUMBIA
FUEL CELL COLLABORATIVE

Appendix L: Fuel Cell Challenge Website Statistics

Google Analytics

http://www.fuelcellcollaborative.com ...
www.fuelcellcollaborative.com...

Audience Overview

Oct 1, 2011 - Sep 30, 2012

% of visits: 100.00%

Overview

1,244 people visited this site

- Visits: **1,785**
- Unique Visitors: **1,244**
- Pageviews: **6,424**
- Pages / Visit: **3.60**
- Avg. Visit Duration: **00:03:22**
- Bounce Rate: **49.69%**
- % New Visits: **69.69%**

69.80% New Visitor
1,246 Visits

30.20% Returning Visitor
539 Visits

	Language	Visits	% Visits
1.	en-us	1,558	87.28%
2.	en	37	2.07%
3.	zh-cn	24	1.34%
4.	(not set)	23	1.29%
5.	en-gb	20	1.12%
6.	de	17	0.95%
7.	fr	15	0.84%
8.	ko	14	0.78%
9.	zh-tw	12	0.67%
10.	de-de	9	0.50%

view full report

5.11 Appendix K: NuHub FY13 Action Plan

NuHub, an initiative of Engenuity SC, is an integral part of South Carolina's efforts to create the foundations of a knowledge economy. NuHub is a consortium of public, private, higher education and business development interests that share the common goal of maximizing the economic and job creation impact of the nuclear renaissance on the Midstate of South Carolina.

In working to diversify the state's current primary economic dependence on manufacturing, agriculture and tourism, Engenuity SC is leading efforts to establish Columbia as a center of alternative energy and clean technology. Columbia has already invested heavily in creating a world-class environment for the commercialization of fuel cell technologies and NuHub will look to expand this economic development strategy to include sources of clean technology and innovation in nuclear energy, where significant opportunity exists.

Goals:

- Position the Midstate as a leader in nuclear energy innovation
- Maximize the economic and job creation impact of the nuclear renaissance on the Midstate
- Develop world class innovators and a strong workforce for the nuclear economy
- Recruit and retain nuclear scientists, entrepreneurs, innovators and suppliers to make South Carolina a preeminent location for the nuclear economy
- Build the Midstate's reputation as a global leader in nuclear training and develop an international training center
- Establish the Midstate of South Carolina as a hub for small modular reactor (SMR) activity

Initiatives: The following program focus areas have been established to align with industry and regional needs and interests.

- *Innovation*: This initiative is focused on identifying, launching, and nurturing the growth of nuclear-related high tech and alternative energy companies and attracting and increasing research and development activity in the Midstate. The current focus is on small modular nuclear reactor technology.
- *Workforce*: This initiative is focused on developing programs to meet nuclear workforce needs by establishing regional educational and workforce development programs focused on training today's clean energy workforce and growing the future clean energy workforce (K-12).
- *Industry Engagement*: This initiative is focused on recruiting existing suppliers and fostering new suppliers into the nuclear supply chain as well as recruiting new and expanding existing nuclear companies in the region.
- *Communications*: This initiative is focused on developing marketing materials and communications strategies to promote the regional nuclear assets and opportunities in the Midstate.

NuHub FY2013 Roadmap

Goal for 2015 (In 3 Years)	Year 1 Tactic (2013)	Year 2 Tactic (2014)
Identify and nurture the growth of nuclear-related high tech companies (*Innovation*)	Collaborate with regional institutions to identify nuclear research assets and work with them to evaluate opportunities to connect with new or local industry.	Provide needed resources and support to regional institutions as they integrate their research into new or local industry.
Increase research and development activity in the Midstate (*Innovation*)	Work with government affairs resources to engage in early stages of federal funding identification/creation to support research in our regional institutions.	By both proactive and reactive efforts, secure federal support for research and development and continue to identify funding opportunities with endowed chairs.
Develop programs to meet long-term nuclear workforce needs by establishing educational and workforce development programs, while continuously mapping and filling immediate industry needs (*Workforce*)	Complete inventory of all regional academic programs related to the industry and launch an education collaboration aimed at connecting the identified programs; continue to map the industry draw and identify immediate opportunity gaps.	Begin creating a plan to integrate the regional academic programs into a collaborative center of excellence that attracts regional, national, and international participants; continue to map the industry draw and identify immediate opportunity gaps.
Grow the future clean energy workforce pipeline (K-12) (*Workforce*)	Refine our K-12 nuclear career outreach and partner with MEBA to connect with and present to schools and parents.	Expand the role of the speakers bureau to include K-12 classroom outreach. Work with MEBA and MTC to host a career fair.
Recruit new nuclear companies into the region (*Industry Engagement*)	Using the CNC supply chain data and other available resources (like companies identified by SBA grant), identify local suppliers to engage with and determine where gaps in suppliers exist. Recruit conferences to the region to bring in out-of-state companies.	Work with Department of Commerce and Central SC Alliance to recruit suppliers into the region to fill supply chain gaps and recruit companies.
Expand engagement with new and existing nuclear companies in the region (*Industry Engagement*)	Complete a business retention and expansion report via the Business in Motion report.	Develop support services that fit the needs of new and existing companies in the region.
Develop marketing materials	Present at industry	Publish a marketing piece and

and communications strategies to promote the regional nuclear assets and opportunities in the Midstate (*Marketing/Communications*)	conferences around the globe to promote the work and research in the Midstate region, and begin creating a contact database of local companies.	company directory promoting the assets in the Midstate

5.12 Appendix L: NuHub Press Coverage

The State
South Carolina's Homepage™

Back to web version

Monday, Sep 20, 2010

Posted on Sun, Sep. 19, 2010

S.C.'s nuclear future

Firm partners with Savannah River National Solutions for mini-reactor development

Andrew Shain

A nuclear reactor the size of a couple of hot tubs that could power a town the size of Lexington — and be portable — could be made a little more than an hour from Columbia.

A New Mexico company, Hyperion Power Generation, has announced a partnership with the Savannah River National Laboratory that could lead to building mini-reactors at the site near Aiken.

The mini-reactors could power military bases and large industrial plants or serve as large-scale backup power generators. The reactors would be buried 33 feet in the ground and provide enough energy for the equivalent of 20,000 homes, said Deborah Blackwell, Hyperion's policy director. They could be removed after cooling off after several months and moved to another site, she said.

Once production starts, the plant could employ 200 to 500, Blackwell said.

While the first mini-reactor is years away, the partnership is a sign of how the 60-year-old Savannah River Site is looking to find new business as it works to draw down its stores of Cold War-era nuclear weapons fuel.

A year ago, Savannah River National Solutions, a consortium of private firms that operates the site for the Department of Energy, announced plans for the U.S. Energy Freedom Center, dedicated to luring renewable power firms that help cut the nation's oil dependence.

The center wants to attract hydrogen fuel cell, biomass and nuclear energy companies, said Pete Knollmeyer, vice president of strategic planning at Savannah River National Solutions.

Hyperion, a Santa Fe, N.M., firm started by entrepreneurs who have worked with the Los Alamos National Laboratory, is the first firm to join the Savannah River's energy center.

Hyperion impressed Savannah River National Solutions officials because the company came showing the technology first instead of asking for money, Knollmeyer said: "They were not looking for a hand out from us or the government."

Blackwell would not say how much money the company has raised, but the company has enough to build a prototype that would cost about $50 million.

Details about the collaboration between Hyperion and Savannah River are being worked out, but the company is looking for land and expertise of scientists and engineers from the site, Knollmeyer said.

Hyperion also could use some of the site's nuclear fuel that the government currently must pay to get rid of, he said.

Still, the mini-reactors need to get approval from the Nuclear Regulatory Commission, a process that could take years.

The commission does not have funding to test new nuclear technologies, spokesman Scott Burnell said. The money is dedicated to vetting new large nuclear reactors, such as those going into S.C. Electric & Gas' V.C. Summer plant in Fairfield County.

The earliest funding could come is late 2012, Burnell said. Reviews could take three to five years. And because Hyperion is considering a very new technology, "they're not at the front of the line when we get to the reviews," Burnell said. The NRC will first review reactors using technology in use now, he said.

The commission has had preliminary discussions with at least five firms interested in making mini-reactors, Burnell said.

As part of the review, the NRC will also want to talk to any customers wanting to buy the reactors. Hyperion said it has interest in the reactors but declined to name any potential customers.

However, by being on a Department of Energy site, Hyperion can build a prototype and power Savannah River as long as electric is not sent outside the complex, Knollmeyer said. The reactor also could produce isotopes used in medical procedures.

In the short term, Hyperion could open an office in Aiken County within six months, Knollmeyer said.

And Blackwell did not rule out the possibility Hyperion could move its headquarters from the Southwest to South Carolina.

FOR IMMEDIATE RELEASE
September 20, 2010

Contact: Clare Morris
803.413.6808 clare@claremorrisagency.com

New Carolina wins major SBA contract to grow nuclear cluster, create jobs

Organization will develop, assist nuclear companies; SC wins one of 10 awards in the nation.

Today, South Carolina's Council on Competitiveness (New Carolina) has been awarded an "Innovative Economies" contract through the U.S. Small Business Administration (SBA) to further develop the state's nuclear cluster. New Carolina was one of only 10 organizations chosen to receive Innovative Economies funding out of 173 entries nationwide.

SBA's Innovative Economies is a pilot initiative that supports industry clusters, which are designed to maximize the economic strengths of a region, enhancing an area's ability to create jobs and compete on a national and global scale.

Through the SBA award, New Carolina will help more small businesses in the state become nuclear suppliers, helping these companies to grow and create well-paying jobs, and advancing the nuclear cluster in the state as a whole.

Under the SBA contract, which totals about $600,000 (the maximum amount awarded by SBA), New Carolina will identify gaps in the global nuclear supply chain, determine which small businesses can fill the gaps, and connect those businesses with opportunities. In addition, New Carolina will identify new technologies relevant to the nuclear industry that are being developed at the state's universities and technical colleges. Then, it will work to commercialize the innovations through the development of start-up companies to supply the nuclear energy industry. The ultimate goal of the SBA contract is to establish a network of suppliers in South Carolina that can serve the nuclear industry in South Carolina and worldwide.

"South Carolina has long been a leader in the nuclear field and no state would benefit more from a renaissance in nuclear energy than South Carolina," says US Senator Lindsey Graham (R-SC). "Nuclear energy and nuclear technology are job creators in South Carolina."

New Carolina will spearhead the project through its Carolinas' Nuclear Cluster, a group of 37 North and South Carolina-based organizations working to strengthen the industry. CNC will work to recruit small businesses to the nuclear industry; link small businesses with technology, development and financing; and establish mentoring opportunities, so that existing companies can build their customer bases and develop new market opportunities and new companies can become nuclear suppliers.

SCRA, an organization that focuses on applied research and commercialization, will partner with New Carolina on the project, providing small business support through its SC Launch! affiliate as well as project management for the contract. SCRA affliate Advanced Technology International (ATI) will help transfer technology from laboratory-based research and development to small businesses, which can commercialize them.

New Carolina Executive Director George Fletcher says that the SBA contract is timely in South Carolina because the nuclear energy supply chain needs attention and small businesses have a place in the industry.

"Nuclear power is the only carbonless source of baseload energy and there are $30 billion dollars of new nuclear plants being proposed within 2.5 hours' drive of Columbia. SCANA, Duke Energy, Southern, Progress and Santee Cooper are all working on the permitting of new plants. They will all use the Westinghouse AP 1000 Reactor. Since a new nuclear plant has not been built in 30 years, 80 percent of the parts for that reactor are now being manufactured offshore. The domestic supply chain has atrophied," Fletcher says. "South Carolina has a robust nuclear energy industry, already employing 15,000 people. At peak construction, there will be 38,000 jobs in the state. The combination of new power plants plus service for the existing fleet of reactors creates a critical mass of opportunity that can be tapped by small business. We are excited to have this SBA support to help existing SC companies tap into these opportunities and to help launch new firms."

"We are pleased to partner with New Carolina on this important nuclear cluster program that will assist in the transition into local and national markets of nuclear R&D technologies developed by small businesses in South Carolina," says Bill Mahoney, SCRA CEO. "Through its proven business models, SCRA's ATI affiliate continues to demonstrate both the technical capability and technical capability and process competency to outdistance formidable competitors and secure contracts to benefit both South Carolina and national clients. Teaming and winning with New Carolina in this bid is particularly rewarding and we look forward to sustained delivery of assured outcomes through this partnership."

About New Carolina
South Carolina's Council on Competitiveness (New Carolina) is a public-private partnership working to increase South Carolina's economic competitiveness through a cluster development strategy. Its focus is to: 1) Strengthen core industries through clusters, 2) Foster innovation in business and education through initiatives, 3) Connect the dots across efforts. Building and supporting clusters was the top recommendation of Harvard Professor Michael Porter, who presented his analysis of South Carolina when he came to South Carolina in 2003. New Carolina is the go-to organization for cluster development, bringing leaders of companies within the same industry together to facilitate, define and implement industry-wide strategies. New Carolina works with 15 statewide and regional clusters including Advanced Security, Agribusiness, Automotive, Aviation/Aerospace, Life Sciences, Composite, Creative, Textiles, Transportation, Distribution and Logistics, Engineering, Insurance Technology, Recycling, Tourism and Nuclear. www.newcarolina.org

About the CNC
The Carolinas' Nuclear Cluster (CNC) is a group of 37 North and South Carolina-based organizations that collaboratively strengthen workforce, services, products and policies to capture and extend South Carolina's global leadership in nuclear energy capabilities. The Cluster operates under the New Carolina organization in Columbia. www.newcarolina.org/clusters/nuclear.aspx

About SCRA
SCRA is a global leader in applied research and commercialization services with its headquarters in South Carolina. SCRA collaborates to advance technology, providing knowledge-based solutions with assured outcomes to industry and government, with the help of research universities in SC, the US and around the world. SCRA currently manages over 100 national and international programs worth over $1.4B in applied R&D contract value. **http:/www.scra.org**

Print (#)

Clyburn still committed to nuclear industry

U.S. Rep. Jim Clyburn, D-S.C., said at this morning's news conference at his Columbia district office that he is committed to development of new nuclear power plants to supply America with electricity. Clyburn also spoke about redistricting, Libya and the annual budget.

By James T. Hammond
jhammond@scbiznews.com (mailto:jhammond@scbiznews.com)
Published March 28, 2011

U.S. Rep. Jim Clyburn (http://clyburn.house.gov/), D-S.C., remains firmly committed to development of new nuclear power plants to supply America with electricity, and he said this morning that he's confident a majority in Congress feel the same way.

"I know Congress pretty well," said Clyburn, the assistant Democratic leader in the House. He added that the development of oil alternatives, such as nuclear power, solar power and wind power, is vital to national security.

"Every time we purchase a barrel of oil, we are funding people who may make war on us," Clyburn said.

Clyburn, who represents South Carolina's 6th Congressional District, noted that emerging nuclear technology is the product of a half-century of collective experience worldwide. For example, plants were once built by the water's edge, but it's no longer necessary — or advisable — to build them beside the sea.

It would be "foolhardy" to terminate nuclear power in this country, he said. "I don't believe there's going to be a moratorium."

Certainly, he said, there will be changes in nuclear strategy, construction and operations because of the Japanese nuclear crisis that followed the earthquake and tsunami on Japan's coast earlier this month.

"We'll think about this going forward," he said. "Life is a series of adjustments. This Japanese experience will bring on adjustments."

Clyburn spoke about a range of issues at this morning's news conference at his Columbia district office.

Redistricting

On the redrawing of congressional lines that will add a seventh district to South Carolina, Clyburn said he expects the new district to be drawn with Horry County as its demographic core, taking in Marion County, part of Florence County and some of Charleston and Georgetown counties. Such a district would take geography away from his own 6th district and from the 1st Congressional District, which is represented by Republican Tim Scott.

Libya

Clyburn said he supports President Barack Obama's decision to intervene in Libya.

"I know some are concerned about cost, about a third front, and about who we are dealing with among the rebels," Clyburn said.

But he added that he's confident the U.S. administration would not have joined the military intervention without some knowledge of the people leading the revolt against the authoritarian regime in Tripoli.

Citing the fable of the tortoise and the hare — and his own fondness for turtles — Clyburn said of Obama's approach to the Libyan intervention, "I prefer evolution to revolution any day."

Budget

Clyburn urged Republicans, who now control the U.S. House, to come to the table with a plan for an annual budget for the federal government, which is currently weathering rounds of two- to three-week temporary appropriation while the Democratic administration and the Republican House seek common ground.

Clyburn said last year's lame duck Congress cut $41 billion in spending, followed by other cuts of $4 billion and $6 billion, bringing the total reduction since last fall's elections to $51 billion. He said he expects the Obama administration to put forward an additional $20 billion in cuts this week.

"Democrats have met Republicans' call for $100 billion in cuts more than halfway," Clyburn said. "Unless you are just interested in cutting to inflict pain, I think it's time for agreement."

Print (#)

The commission has had preliminary discussions with at least five firms interested in making mini-reactors, Burnell said.

As part of the review, the NRC will also want to talk to any customers wanting to buy the reactors. Hyperion said it has interest in the reactors but declined to name any potential customers.

However, by being on a Department of Energy site, Hyperion can build a prototype and power Savannah River as long as electric is not sent outside the complex, Knollmeyer said. The reactor also could produce isotopes used in medical procedures.

In the short term, Hyperion could open an office in Aiken County within six months, Knollmeyer said.

And Blackwell did not rule out the possibility Hyperion could move its headquarters from the Southwest to South Carolina.

The State
South Carolina's Homepage™

Back

Wednesday, Apr 27, 2011

Posted on Tue, Apr. 19, 2011

Mininuke conference attracts 250

Columbia meeting to focus on development of small reactors

By JEFF WILKINSON
jwilkinson@thestate.com

Columbia and South Carolina this week will be the center of worldwide discussion over commercial miniature nuclear reactors, power plants smaller than a double-wide trailer that could be marketed to countries and industries worldwide.

The Small Modular Reactor Conference will be held today and Wednesday at the Columbia Marriott conference center.

Boosters say small reactors could be a new growth industry for South Carolina, with the Palmetto State poised to take a leadership position. But nuclear critics say "mininukes" still produce dangerous atomic waste that would have to be disposed of — and the units shouldn't be marketed to unstable countries.

If you go

What: Small Modular Reactor Conference

When: Today and Wednesday

Where: Columbia

Marriott, 1200 Hampton St.

Cost: $2,000-$3,400 per person

Info: nuclearenergyinsider.com/smr/index.shtml

Small reactors have for years been used to power aircraft carriers and nuclear submarines, but no private commercial reactors have been permitted. Building and marketing the small reactors could help supply power at a time of increasing demand for more energy sources, boosters say.

About 250 attendees — twice the number expected — have signed up for the $2,000-$3,400 per person conference. Among them are international nuclear construction heavyweights AREVA, Babcock & Wilcox and Westinghouse; U.S. government agencies such as Energy and Defense; several national laboratories; and international entities, such as the Korea Atomic Energy Research Institute. U.S. Sen. Lindsey Graham, U.S. Rep. Jim Clyburn and Columbia Mayor Steve Benjamin also will attend and speak.

"This is a big opportunity for South Carolina because we've got so many of our local political and industry people on the agenda," said Neil McLean, executive director of Engenuity SC, which is helping organize the conference. "The participants will come here and see all these experts from South Carolina. It's an opportunity for them to connect with the state."

It isn't yet clear how the recent atomic crisis in Japan will affect support for miniature nuclear plants. The plants are smaller than traditional reactors like those that leaked radiation after the Japanese earthquake and tsunami last month.

Minireactors can be as small as a couple of hot tubs or approach the size of a double-wide trailer. They could power a manufacturing plant, a military installation or a town the size of Anderson using existing infrastructure without the siting difficulties facing large reactors. Minireactors would be buried in the ground and provide enough energy for the equivalent of 20,000 to 100,000 homes. Reactors would then be moved to another site after cooling off for several months.

It would be years before any minireactors would be operating commercially in the U.S. The Nuclear Regulatory Commission would have to approve the design of a minireactor for the first time, then license the plants — processes that could take a minimum of two years, NRC spokesman Roger Hannah said.

In September, a New Mexico company, Hyperion Power Generation, announced it would partner with the Savannah River National Laboratory in a collaboration that could lead to building minireactors at the site near Aiken. Once production starts, the plant could employ 200 to 500, Hyperion officials said at the time.

In October, the Savannah River Site announced it would look at a demonstration project for a GE-Hitachi small reactor at the federal weapons complex near Aiken. NRC spokesman Hannah said his agency doesn't expect the first design application for any miniature nuclear reactor until late next year, at the earliest.

Internationally, small reactors are of interest because they can be used to provide power to remote areas of Third World countries.

Critics, however, say that distributing miniature nuclear plants to unstable countries could allow dangerous atomic materials to fall into the hands of terrorists. Since the plants would be so small, entire reactors could be stolen while in transport, they say.

Critics also note that miniature nuclear plants would create deadly, high-level atomic waste, just like larger traditional reactors. The government has no central place to store high-level waste.

Prominent national anti-nuclear activists are expected in Columbia for the conference, including Union of Concerned Scientists expert Ed Lyman and Tom Cochran, a senior scientist with the Natural Resources Defense Council. They were flying in from Washington, said Tom Clements, a regional anti-nuclear organizer with Friends of the Earth.

Clements said the conference is an attempt by miniature nuclear plant boosters to drum up business for what he said is an unproven, and potentially dangerous, technology.

"I think this conference is going to be more cheerleading than revealing some of the facts," Clements said.

Clements said big utilities may not be sold on mininukes because these plants could compete with plans to build new, traditional reactors. SCE&G and Duke Energy both plan new reactors in South Carolina.

Despite critics, nuclear power has strong bipartisan support in South Carolina.

Graham, a Seneca Republican who lives five miles from Oconee Nuclear Power Station and led a tour there last month, said he is participating because, "I believe in nuclear power."

"As a state, South Carolina is uniquely positioned to be one of the states which benefits the most from a renaissance in nuclear energy," he said in a statement. "Today, almost half of the electricity generated in our state comes from nuclear energy. We have the work force and expertise to excel in this area."

Clyburn, a Columbia Democrat, echoed Graham's sentiments.

"I believe it is important that we have an ongoing dialogue about the importance of nuclear energy as a part of our nation's future energy policies," he said in a statement. "I am a strong supporter of nuclear as a reliable, clean energy resource. We live in a state that is very tolerant of nuclear, and we must continue to support and advocate for its safety and viability in the future."

McLean said the remarkable interest in this week's conference results from general public and governmental support for nuclear energy in South Carolina and an upcoming $10 million grant from the U.S. Department of Energy for someone to build the first private minireactor.

"There is really a lot of buzz going on about South Carolina and SMR right now," McLean said. "Everyone is looking for partners."

Mayor Benjamin said the conference could cement the Midlands and South Carolina as a center for the development and production of the minireactors, much as the National Hydrogen Association Conference & Expo in 2009 helped set the city and state as a center for hydrogen and fuel cell research and production.

"The conference is also part of a much larger effort to position this city and this region to lead a global energy revolution, and that's very exciting," he said.

Small Modular Reactor Conference Marks Debut of NuHub

Tuesday, 26 April 2011 13:05

Carolina Headlines - Energy & Renewables

COLUMBIA, SC – NuHub, an initiative launched by a collaborative group of public, private, higher education, and workforce development stakeholders led by EngenuitySC, debuted at the Small Modular Reactor (SMR) conference in Columbia last week.

The conference attracted agencies from around the world and industry heavyweights such as Westinghouse, AREVA, and GE, along with the U.S. Department of Energy, the Nuclear Regulatory Commission, the U.S. Army and utilities across the nation, including TVA and SCANA. The speakers, ranging from industry experts, to elected officials, to global CEOs, outlined the challenges, opportunities, and benefits of developing, producing, and using SMRs to address the energy needs of the future. The conference also highlighted NuHub's plans to work to provide a platform supporting the growth of the nuclear industry in the Midstate region of South Carolina.

The message of the Midstate as a hub of the nuclear industry was echoed by high-profile panelists including South Carolina Congressmen Jim Clyburn and Joe Wilson. "We are very much bipartisan on the effort to attract nuclear energy companies to our respective districts in the Midstate of South Carolina," Wilson said. Clyburn concurred: "We have worked together, and will continue to work together, to ensure the ongoing success of the nuclear industry in our state."

Steve Byrne, co-chairman of NuHub, outlined the steps the region will take to build on its tradition as a center for nuclear power. "Within the next 15 years," Byrne said, "there will be major capital investment in nuclear power generation deployed within a 100 mile radius of Columbia, so this presents a significant opportunity for the Midstate region to expand nuclear and other clean technologies."

What's more, the Midstate of South Carolina is home to a number of universities and technical colleges that are certified to train nuclear engineers, as well as to help nuclear suppliers learn the skills necessary to succeed in the industry. "The Midstate region possesses a unique blend of talented workforce, existing sites, and resources, combined with an unmatched entrepreneurial spirit," said Dr. Sonny White, president of Midlands Technical College. "These assets contribute to positioning our region as a potential, national hub for the nuclear industry, and Midlands Technical College is proud to partner in this endeavor as we prepare the next generation of South Carolina's workforce to take advantage of these new economic development opportunities."

In addition to Midlands Tech's workforce development programs, the University of South Carolina has a respected nuclear engineering program, whose graduates will be looking to fill the gaps that will soon open as a large percentage of the nuclear industry's workforce retires. And, as Congressman Clyburn pointed out, South Carolina State University boasts "the only undergraduate nuclear engineering program located at an HBCU (historically black college/university."

With its history of nuclear power around the Savannah River Plant and other sites, its educational resources, and its concerted push to establish the area as a nuclear hub, the Midstate is well-positioned to expand its reach and build on its strengths. "The key to growing our knowledge-based economy in the Midstate region is

leveraging our existing resources and seeking opportunities where we can be a leader," said Neil McLean, executive director of EngenuitySC. "The SMR Conference is a great example of this, and it has allowed us to make an impression and show companies why they would have a competitive advantage if they located or expanded their operations in the Midstate," he concluded.

About NuHub
NuHub is a collaborative group of public, private, higher education and workforce development stakeholders working to maximize economic and job creation opportunities for the nuclear industry in the Midstate region of South Carolina, and to establish the Midstate as a hub and global leader for nuclear energy innovation. NuHub's executive committee is comprised of broad, collaborative leadership representing the region's strong nuclear assets and supporters, which will provide strategic vision, governance and direction to the group. Executive committee members include: Co-chairman Steve Byrne, Chief Operating Officer and Executive Vice President for Generation and transmission at SCE&G; Co-chairman Dr. Sonny White, President of Midlands Technical College; Don Herriott, Director of Innovista Partnerships for the University of South Carolina; and Donald Goldbach, Director of Manufacturing Strategy with Westinghouse Electric Company. A Leadership Committee and Advisory Board will also serve the role of providing community input to NuHub and will consist of a diverse range of stakeholders. Regional participants include representatives from the Good to Great Foundation of the Greater Columbia Chamber of Commerce, SCRA, Midlands Technical College, the University of South Carolina, Westinghouse, SCANA, SRNS, DOD, Shaw Group, Tetra Tech, and local community and business leaders. Please visit www.Nuhubsc.com for more information.

About EngenuitySC
EngenuitySC is a public/private partnership with the mission of growing the knowledge-based economy in the Columbia, SC, region. EngenuitySC leads initiatives that leverage the region's assets, promote commercialization, and support research while building collaborations around these projects that are comprised of leaders from business, government and higher education. Together these partners foster an environment where entrepreneurship, innovation, and the creation of knowledge are fundamental elements of the region's identity enabling us to imagine more jobs and opportunities for the future.

Next >

For Immediate Release:
May 30, 2012

Contact: Karen Owens 803.413.6789 or Karen@kocommunications.com

Microburst Learning Completes 50th Online Job Shadow for the State

Latest MicroCareerBurst™ promotes careers in Nuclear Energy production

Columbia, SC – Microburst Learning announced that it has completed its 50th online educational tool for South Carolina students, educators and parents to promote careers in the nuclear energy production arena. Sponsored by EngenuitySC and SCANA, the **Nuclear Energy Production MicroCareerBurst™** discusses the growing need for highly trained workers as new nuclear capacity is expanding with the construction of two new nuclear reactors in Fairfield County. Highlighted jobs in the e-lesson include nuclear operators, radiation protection technicians and nuclear engineers.

According to Dr. Sonny White, President of Midlands Technical College and Co-Chair of EngenuitySC's NuHub initiative, the expansion of nuclear power generation in the Southeast brings a wealth of opportunity for high-paying and stable jobs in what schools refer to as STEM careers, ones focusing on science, technology, engineering and math. "As new jobs come online and an aging nuclear workforce gets ready to retire, it is vital that we get today's middle and high school students excited about the variety of jobs they can pursue in the nuclear energy arena," Dr. White explained. "Working with our partners at SCANA, we are using the power of the Internet to share valuable information with students, teachers and even parents about what skills and training are needed to succeed in this career path."

The 20-minute interactive job shadow experience allows students to experience what typical job tasks are required, what education and training are needed, what work hours and compensation levels they can expect and why people working in the nuclear energy industry find their careers meaningful and fulfilling. The e-lesson combines video testimonials with colorful animation and graphic design, interactive games and contemporary music to capture a teenager's attention span and multimedia usage.

"We anticipate a need for 800 to 1000 new employees as our new AP1000 reactors come online in 2017 and 2018," said Scott Macfarland, manager of SCANA's Corporate Workforce Planning division. "This MicroCareerBurst is one of several ways we are getting the word out to the next generation workforce about the benefits of working in our safe and productive nuclear energy industry. We hope that students who participate in the online shadowing experience will go on to enroll in some of the programs we've established with Midlands Technical College, the University of South Carolina and a number of other higher education institutions to build our future workforce pipeline."

The beauty of the MicroCareerBurst tools is the ability to share consistent career information in an engaging and instructive format regardless of what part of the state a student resides. Students in metropolitan, rural and suburban school districts all have free online access 24/7 through the state's Personal Pathways to Success web portal (www.scpathways.org.) Upon completing the e-lesson, the experience is populated into the student's individual graduation plan, or IGP, as an extended learning opportunity which is required to build career readiness.

For more information about MicroCareerBursts and opportunities to promote other career fields, please visit www.microburstlearning.org or call 877-719-5073.

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5.13 Appendix M: NuHub Model Presentation

Renaissance

NuHub

A GLOBAL CONNECTION FOR NUCLEAR OPPORTUNITIES

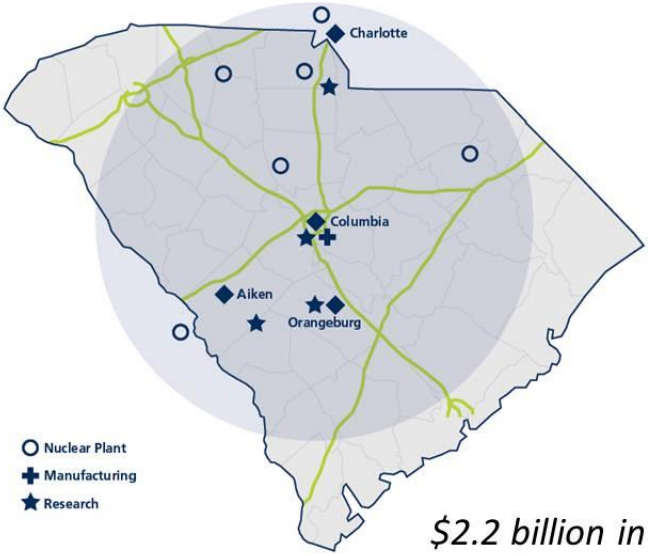
NuHub

CentralSC Alliance Board Meeting

March 22, 2012

NuHub

A GLOBAL CONNECTION FOR NUCLEAR OPPORTUNITIES



$2.2 billion in payroll

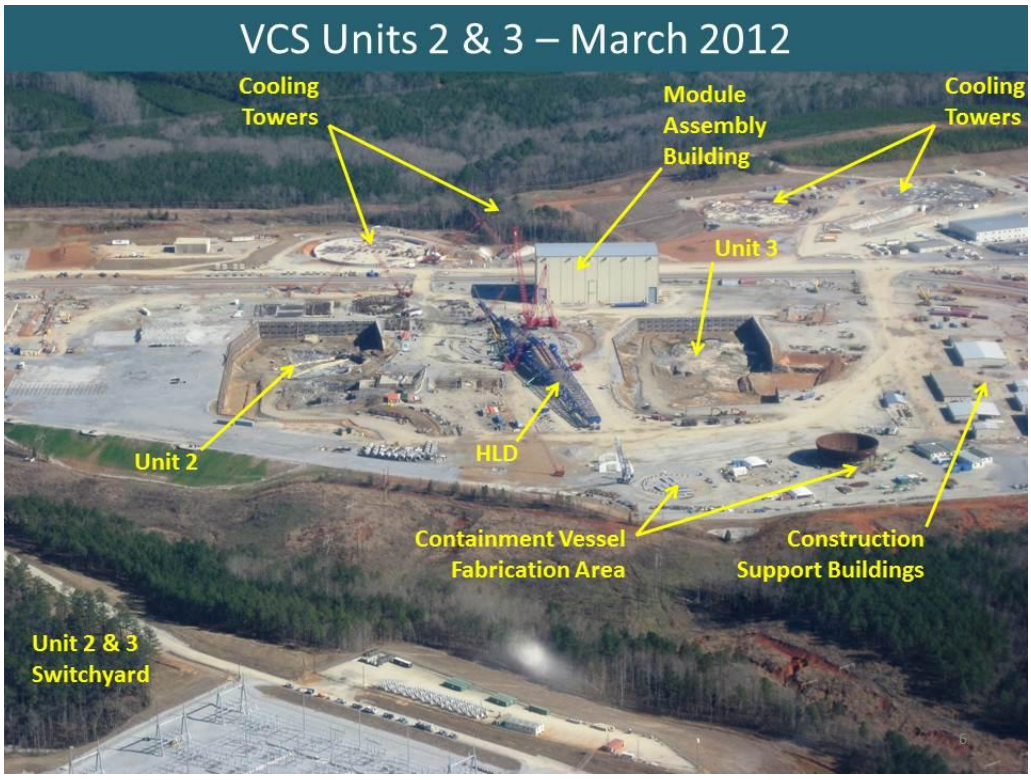
Nearly $5 billion in earned income

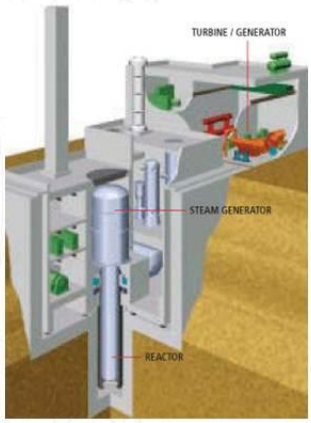
Over 28,074 Current Jobs

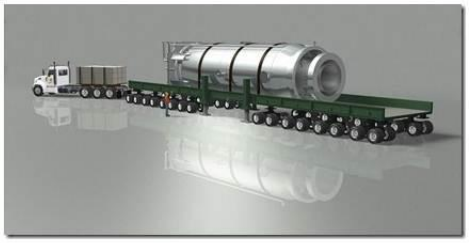
Maximizing economic impact……

Fostering Job Creation


Workforce Development
Industry Engagement
Innovation
Communications


VCS Units 2 & 3 – March 2012
Cooling Towers
Module Assembly Building
Cooling Towers
Unit 3
Unit 2
HLD
Containment Vessel Fabrication Area
Construction Support Buildings
Unit 2 & 3 Switchyard





Westinghouse

HOLTEC INTERNATIONAL

Hyperion Power
New Clear Energy

NuScale Power

"SMR" Innovation = Economic Development

Workforce = Economic Development

Innovation = Economic Development

Communications = Economic Development

Industry Leaders
SCANA/SCE&G
Savannah River National Laboratory
Santee Cooper
Westinghouse Electric Company

Education/Other Resources
Allen University
Benedict College
CentraSC Alliance
Claflin University
Midlands Technical College
SCRA
SC State University
SC Technical College System
University of South Carolina

Supplier/Contractors/Service Providers
Alpha Manufacturing Company
AvanTech Inc.
Carolina Fabricators
Carolina Systems Inc.
Energy Solutions
Garlock Helicoflex
Global Pundits
Moto Corporation
RCS Corporation
Tetra Tech
URS Coporation
Weld Spect Technologies

Regional Industry Leaders and Suppliers

NuHub
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www.nuhubsc.com

www.nuhubsc.com
khutton@engenuitysc.com

5.14 Appendix N: NuHub Publicity Materials

Start a Small but Powerful Reaction.

NuHub
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Join us for breakfast as we kick off the 2nd Annual SMR Nuclear Energy Insider Conference!

NuHub welcomes you to Columbia and invites you to start your conference by making powerful connections with industry insiders at breakfast.

NuHub 2012 Breakfast
7:15–8:15 AM
Tuesday, April 24, 2012
Greystone Hall at Embassy Suites
Columbia, SC

engenuitySC™
Imagine More

Please fill out this card and bring it with you to breakfast.

Name _____

Title _____ Company _____

Email _____

❑ Yes, contact me with more information about NuHub

www.nuhubsc.com


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NuHubSC.org
Maximizing
Economic
Impact and
Job Creation
Resources
engenuitySC™
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Supporting
Nuclear
Education and
Innovation
Knowledge
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NuHubSC.org
Fostering the Nuclear Resurgence
Renaissance
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NuHub
A GLOBAL CONNECTION FOR NUCLEAR OPPORTUNITIES
NuHubSC.org
Connecting Our Region's Nuclear Assets
Collaboration
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About NuHub

NuHub, an initiative of EngenuitySC, is an integral part of South Carolina's efforts to create the foundations of a knowledge economy. In working to diversify the state's current primary economic dependence on manufacturing, agriculture and tourism, EngenuitySC is leading efforts to establish Columbia as a center of alternative energy and clean technology. Columbia has already invested heavily in creating a world-class environment for the commercialization of fuel cell technologies and NuHub will look to expand this economic development strategy to include sources of clean technology and innovation in nuclear energy, where significant opportunity exists. NuHub is a consortium of public, private, higher education and business development interests that share the common goal of maximizing the economic and job creation impact of the nuclear renaissance on the Midstate of South Carolina.

NuHub goals:

- Position the Midstate as a leader in nuclear energy innovation
- Maximize the economic and job creation impact of the nuclear renaissance on the Midstate
- Develop world class innovators and a strong workforce for the nuclear economy
- Recruit and retain nuclear scientists, entrepreneurs, innovators and suppliers to make South Carolina a preeminent location for the nuclear economy
- Build the Midstate's reputation as a global leader in nuclear training and develop an international training center
- Establish the Midstate of South Carolina as a hub for small modular reactor (SMR) activity

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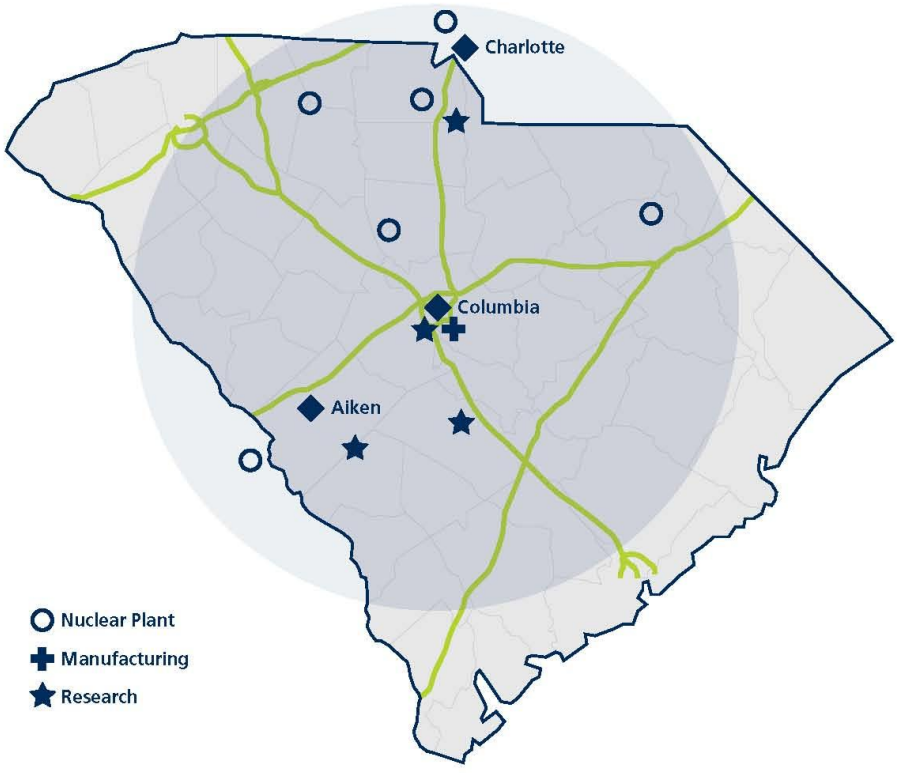
Columbia

Centrally Located

Within the next 15 years, more than $40 billion of capital investment in nuclear power generation will be deployed within a 100 mile radius of Columbia, SC. This presents a significant opportunity for our region to expand nuclear and other clean technology economic activity in the region.



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Central Position

Columbia is located in the center of a rare, if not unique, corridor of companies, facilities, and educational institutions that play a significant role in the nuclear industry. These facilities include the Savannah River National Laboratory, several military installations, multiple commercial nuclear power plants, the University of South Carolina, Midlands Technical College, several interstate highways and the Port of Charleston. With planned investments and significant resources in the area and surrounding region, Columbia offers numerous advantages for nuclear-related businesses looking to grow with the industry.

Supportive Business Climate Columbia has several active business development groups supporting a new and energetic city government that believes the added diversity of the knowledge economy is vital to the future of this area of South Carolina.

Education Focused on the Knowledge Economy Columbia has the educational resources in place to become a nuclear engineering, technology and training center for the expanding nuclear industry. The University of South Carolina is a nationally recognized research facility with an active nuclear engineering program in the College of Engineering and Computing. Further, with its Moore School of Business, School of Law and ongoing projects such as the Innovista research district, the University has the power to produce the quality managers needed to deploy new technology around the world.

Trained nuclear operators are critical. Midlands Technical College (MTC) offers cutting-edge programs to train technicians in nuclear-related skills and is expanding its programs to include the full range of technical skills needed by current and future nuclear facilities.

Market Access The majority of new nuclear plants are scheduled to be located in the Southeast. Columbia's central location in the Southeast and its access to major highways and port facilities offer nuclear manufacturers and parts fabricators easy access to critical export and import facilities.

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Research & Education

Research and Development

The state of South Carolina has awarded the University of South Carolina (USC) two research Centers of Economic Excellence (COEE) for Nuclear Science and Engineering through the SC Centers of Economic Excellence Act. These awards enable USC to establish endowed chairs in nuclear engineering. The two research centers serve as a catalyst to spur public-private industrial partnerships, expand the state's knowledge base, conduct cutting-edge research, create high-paying jobs and enhance economic opportunities.

Less than an hour's drive from downtown Columbia, the Savannah River National Laboratory (SRNL) is home to the applied research and development laboratory at the U.S. Department of Energy's (DOE) Savannah River Site (SRS). This laboratory applies state-of-the-art science to provide practical solutions to complex technical problems including converting highly enriched uranium into materials suitable for use in commercial nuclear reactors, producing new tritium for national security, receiving and storing spent nuclear fuel from across the nation and around the world, consolidating the nation's plutonium and uranium, and managing wastes.

Higher Education

Established in 2003, the graduate nuclear engineering program at USC offers MS (thesis and non-thesis options) and doctoral degrees in nuclear engineering. Graduates of the program find employment at nuclear utilities, the NRC, SRNL, ORNL, DOD, reactor vendors and nuclear related architect/engineering firms.

USC established a minor in nuclear engineering in fall 2008. This program was initiated in response to feedback from the nuclear power industry that suggests graduates across all engineering disciplines could improve their productivity at a nuclear utility or related industrial concern with the experience a minor in nuclear engineering provides.

South Carolina State University introduced its undergraduate Nuclear Engineering Program in 2002 in cooperation with the University of Wisconsin at Madison. The program has produced two dozen graduates through May 2011. Graduates of this program are prepared for a broad spectrum of opportunities in the nuclear industry including planning, designing, developing, testing and/or operating nuclear reactors. The curriculum emphasizes the fundamentals of engineering, preparing students for graduate studies in nuclear engineering, radiological sciences, materials sciences and other fields.

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Workforce

Training and Development

Workforce Training With its recent program innovations in nuclear, mechanical and chemical technologies, and skilled crafts, Midlands Technical College (MTC) is uniquely positioned to enhance the regional growth and profitability of the nuclear energy sector. Centered in South Carolina, MTC offers energy-related programs in engineering and industrial technologies. Non-credit skilled crafts courses are offered through MTC Corporate and Continuing Education, one of the largest providers of non-credit professional training in the state.

MTC is the recipient of highly competitive significant federal grants, including $438,517 from the U.S. Nuclear Regulatory Commission for curriculum development and scholarships in the college's Nuclear Systems Technician program. MTC is currently applying to be a consortium partner in the Southeastern Regional ATE Center of Excellence for Nuclear Energy Education and Training through a proposal to the National Science Foundation.

Midlands Technical College has a core mission of providing the essential workforce for economic development. The college actively supports regional energy industries through curriculum development, student and employee training opportunities, specialized software support and training for employers as the state increases its focus on new energy solutions. MTC's recent program expansions include the new Nuclear Systems Technician certificate as part of the associate degree in Mechanical Engineering Technology, and expansion of the Chemical Technology and the Alternate Energy Technology Principles certificates. MTC also offers Industrial Technology programs in the skilled crafts and short-term QuickJobs training through its Continuing Education Division. These programs prepare workers for careers as welders, electricians, pipe fitters and form carpenters - all vital jobs in the construction and support of nuclear facilities.

K-12 Initiatives Based in Columbia, Allen University, in collaboration with the Space and Naval Warfare Systems Command Atlantic, is implementing the HBCU NNSA Pipeline Program designed to increase the number of young students in the pipeline for science, technology, engineering and math education, and to train the next generation of nuclear security professionals. The project is part of the National Nuclear Security Administration's Historically Black Colleges and Universities Pipeline Project.

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Regional Assets

Industry Leaders
SCANA/SCE&G
Savannah River National Laboratory
Santee Cooper
Westinghouse Electric Company

Suppliers/Contractors/Service Providers
Alpha Manufacturing Company
AvanTech Inc
Carolina Fabricators
Carolina Systems Inc.
Energy Solutions
Garlock Helicoflex
Global Pundits
Moto Corporation
RCS Corporation
REVOIT LLC
Tetra Tech
URS Corporation
Weld Spect Technologies

Public Sector Partners:
City of Columbia
Fairfield County
Richland County
SC Department of Commerce

Education Resources/Others:
Allen University
Benedict College
CentralSC Alliance
Claflin University
EngenuitySC
Greater Columbia Chamber of Commerce
Midlands Technical College
Midstate Chamber Coalition
Navigating from Good to Great Foundation
New Carolina
SCRA
SC State University
SC Technical College System
University of South Carolina

A Global Connection for Nuclear Opportunities

5.15 Appendix O: NuHub Website Statistics

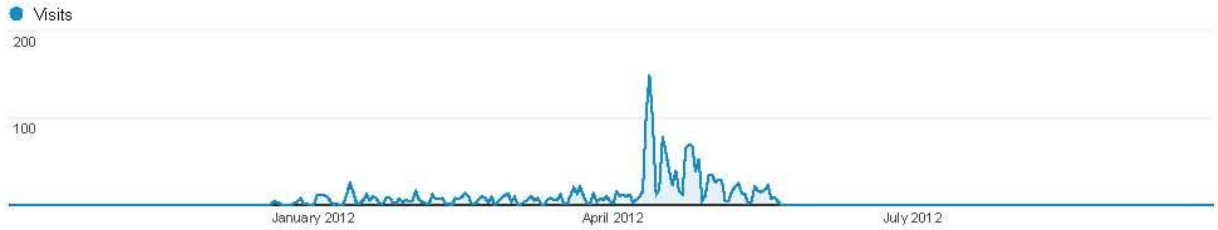
Google Analytics

NuHub - http://www.nuhubsc.com
NuHub [DEFAULT]

Audience Overview Oct 1, 2011 - Sep 30, 2012

% of visits: 100.00%

Overview



1,519 people visited this site

- Visits: **2,036**
- Unique Visitors: **1,519**
- Pageviews: **6,955**
- Pages / Visit: **3.42**
- Avg. Visit Duration: **00:03:05**
- Bounce Rate: **44.50%**
- % New Visits: **74.36%**

74.36% New Visitor
1,514 Visits

25.64% Returning Visitor
522 Visits

Language	Visits	% Visits
1. en-us	1,859	91.31%
2. en	28	1.38%
3. ja	23	1.13%
4. en-gb	15	0.74%
5. ko	14	0.69%
6. fr	9	0.44%
7. zh-cn	9	0.44%
8. it	8	0.39%
9. tr	8	0.39%
10. de	6	0.29%

view full report