

2015



ENERGY PRODUCTION AND INFRASTRUCTURE CENTER ANNUAL REPORT



UNC CHARLOTTE

The WILLIAM STATES LEE COLLEGE of ENGINEERING
Energy Production and Infrastructure Center



Johan H. Enslin | EPIC Director

LETTER FROM THE DIRECTOR

I am pleased to present the 2015 Annual Report of the Energy Production and Infrastructure Center (EPIC) of the University of North Carolina at Charlotte. With steady growth in enrollment, a continued increase in funding and the expansion of research, EPIC had another strong year. On the following pages you will find a summary of the accomplishments of EPIC and its faculty over the 2014-2015 academic year.

Enrollments are strong and growing with a 23% increase in the number of undergraduate students with an energy concentration and a 19% increase in undergraduates enrolled in energy courses compared to the previous year. A vital part of EPIC is the applied research we are conducting. I am pleased to report that this year EPIC Associates saw an increase of 56% in awards received for research.

Speaking of research, EPIC's research clusters remain busy and we have created a new Transportation Energy Cluster, which will engage the passenger and freight transportation industry to provide solutions in workforce development, research and testing, and infrastructure improvement. A key feature of the cluster will be the Innovative Rail Technology Park, an initiative to advance clean and innovative technology for rail transportation. EPIC also recognized a need for unbiased research on the handling of coal ash and the liquids associated with it. As a result, The Coal Ash and Liquid Management Office (CALM) was formed and is now up and running. CALM helps to develop practical, technology-based solutions for the power production industry to address problems and challenges with coal ash and liquids management. These are just a few of the exciting research developments that happened this past academic year.

A highlight of the year was the dedication of the Siemens Energy Large Manufacturing Solutions Laboratory. With the generous support from Siemens and Hexagon Metrology, the new lab will conduct research on the precision dimensional measurement of large-scale energy components. With the addition of the 60,000-pound Leitz

PMM-F machine, researchers will be able to measure parts up to 3x2x1.6 meters to an accuracy of a few microns.

Not only are EPIC faculty working on innovative and leading research projects, our students are very active in the Senior Design Program at UNC Charlotte. The number of students who worked on energy projects once again increased and in the Spring 2015 Senior Design event, an EPIC affiliated Senior Design Team came in 2nd place among the 75 projects on display, quite an accomplishment as there were many outstanding projects presented.

As EPIC expands our industry relationships we also are strengthening relationships in the academic community. This year EPIC was pleased to host 11 students from Karlsruhe Institute of Technology (KIT) in Karlsruhe, Germany for a six-month exchange. The students added greatly to the work taking place at EPIC and plans are already underway to host another group next year. In addition to hosting students, EPIC also sent four of our students to KIT for a two-month exchange. We have received positive feedback from all involved and are excited to continue and grow this valuable relationship.

EPIC was honored to be asked to host the 47th North American Power Symposium (NAPS). As the only university in the southeast to host in the past 25 years, EPIC welcomed over 280 attendees. The program and papers were very well received and many attendees expressed they wished it had lasted even longer.

While our numbers are increasing, it is the commitment of our faculty and staff who make these numbers possible. Their dedication to our students and their relationships with industry have built a firm foundation upon which EPIC will continue to grow and thrive as we prepare new generations of energy professionals.

Dr. Johan H. Enslin, FIEEE, PrEng
EPIC Director and Professor
Duke Energy Distinguished Chaired Professor

ABOUT UNC CHARLOTTE

The University of North Carolina (UNC) at Charlotte is North Carolina's urban research university. It is the fourth largest campus among the University of North Carolina system's 17 institutions and the largest institution of higher education in the Charlotte region. 2014-2015 enrollment exceeded 28,000 students, including over 5,000 graduate students. The University has seven academic colleges, and offers 78

Bachelor, 61 Master and 21 Doctoral degrees. The William States Lee College of Engineering, located on the Charlotte Research Institute Campus, has paired with the Energy Production Infrastructure Center (EPIC), to create programs, courses and energy concentrations within multiple departments that enhance technical skills and engineering.



ABOUT EPIC

EPIC was formed in response to the need to supply well-educated and highly trained engineers qualified to meet the demands of the energy industry and to provide sustainable support for applied research. Offering a collaborative industry/academic partnership, EPIC produces a technical workforce and advancements in technology for the global energy industry while supporting the Carolinas' multi-state economic and energy security.

With a sophisticated research center, EPIC provides education and applied research opportunities to students with energy related interests. Our industry-education partnerships unite students, faculty and industrial partners to collaborate on interdisciplinary research and learning with a special focus on energy research and education.

EPIC's energy curriculum teaches students project management, collaborative teamwork, risk analysis and

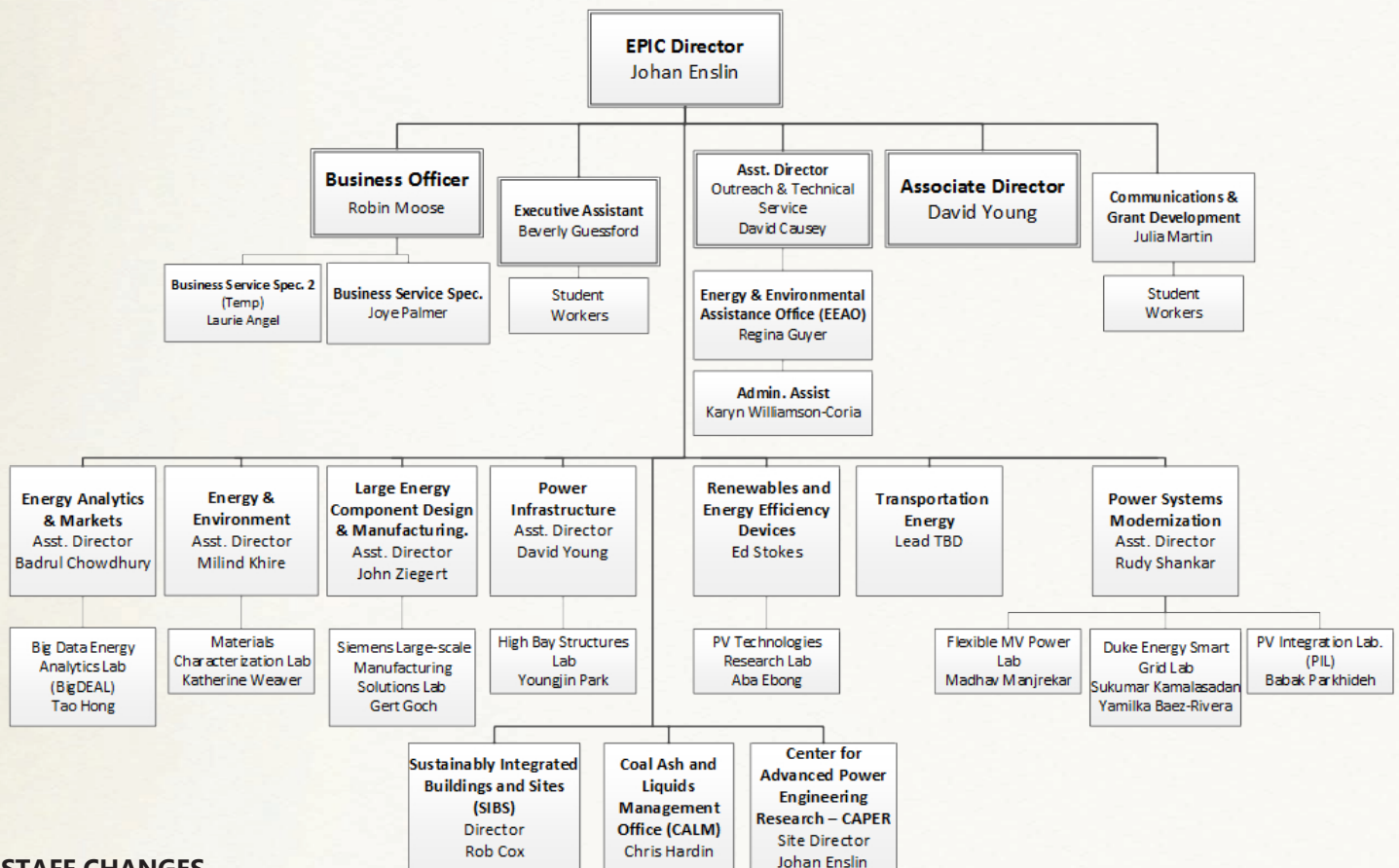
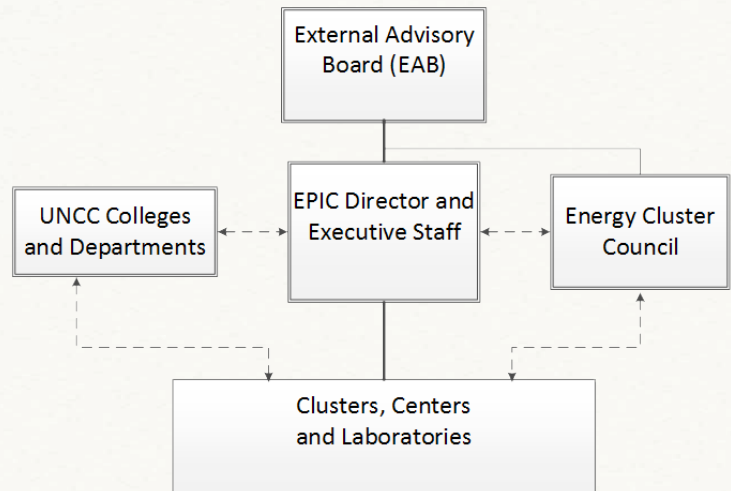
leadership skills. Our facilities assist the energy industry, training the next generation of engineers who will deliver new and creative solutions for the energy community.

With over 75 faculty members working in energy-related disciplines, EPIC is quickly becoming a national leader in energy research and development. Offering seven Applied Research Clusters, EPIC interdisciplinary researchers collaborate with industry and use state-of-the-art laboratories to work to solve some of today's most difficult energy challenges.

EPIC is also home to the civil, environmental, electrical and computer engineering programs of The William States Lee College of Engineering and provides the laboratory and classroom space needed to develop new energy solutions while educating the next generation of energy professionals.

EPIC ORGANIZATIONAL CHARTS

EPIC's activities are strategically led by the External Advisory Board (EAB) and executed through the Energy Cluster Council. Energy Cluster members include faculty, staff, and industry partners, who work together to create programs, events, applied research and partnerships that support EPIC's mission and vision to support the energy industry. Each research cluster and laboratory housed under EPIC has faculty members associated with different colleges and departments across UNC Charlotte's campus



STAFF CHANGES

David Causey was appointed as the EPIC Assistant Director - Technical Services

Chris Hardin joined the EPIC team as the Managing Director of CALM

Julia Martin was appointed the Public Communication Specialist

EPIC EXTERNAL ADVISORY BOARD

Dhiaa Jamil	EAB Chairman Executive Vice President and President - Regulated Generation & Transmission Duke Energy
Mark Boomgarden	Senior Vice President, Operations Akoustis
Mark Ehrnschwender	Vice President of Business Management & Engineering Services STEAG Energy Services LLC
Johan H. Enslin	Director of EPIC UNC Charlotte
Thomas G. Franch	Senior Vice President, Reactors & Services AREVA NP
Robert E. Johnson	Dean, The William States Lee College of Engineering UNC Charlotte
Jim Little	Executive Vice President, Commercial Business Development and Strategy, Nuclear Solutions US Energy ATKINS
Kevon R. Makell	CEO SEWW Energy Incorporated
Arshad Mansoor	Senior Vice President, Research and Development Electric Power Research Institute (EPRI)
Mark Marano	President, Americas Region Westinghouse Electric Company
Jeffrey S. Merrifield	Partner Pillsbury Law
Jimmy B. Morgan	Executive Vice President Allied Technical Resources
Mark A. Pringle	Vice President, Siemens Charlotte Energy Hub Siemens Energy, Inc.
Armistead Sapp	Executive Vice President and Chief Technology Officer SAS
Wayne Wilkins	Chief Executive Officer EnergyUnited
Frank Yoho	Senior Vice President & Chief Commercial Officer Piedmont Natural Gas



EPIC RESEARCH CLUSTERS

To focus and concentrate the applied research of EPIC faculty members, students, and industrial partners, research programs within EPIC are organized into seven clusters. Guidance is provided to these clusters by the Energy Cluster Council, a group of industry leaders focused on creating a sustainable operation and growth environment for EPIC.

ENERGY ANALYTICS AND MARKETS

Badrul Chowdhury

The Energy Analytics and Markets cluster is involved in research studies in the area of energy policy, logistics and supply chain, lean energy system design, electricity market optimization, risk management related to energy markets, sustainable energy management, energy efficiency, and social and environmental impact of energy use. The energy analytics focus on load on energy forecast.

ENERGY AND ENVIRONMENTAL

Milind Khire

The primary objectives of the Energy and Environmental cluster are to solve problems that relate to: disposal, reuse and better management of emissions produced by the energy sector, innovative groundwater and air quality monitoring technologies, advanced testing capabilities in the areas of hydraulic and thermal properties of soils and solid waste for environmental as well as power transmission applications, sensing technologies to monitor and optimize performance of coal combustion residues (CCR) landfills, extraction of bio-gas from municipal solid waste landfills, and mitigation of green house gas emissions and carbon sequestration.

LARGE ENERGY COMPONENT DESIGN AND MANUFACTURING

John Ziegert

The Large Energy Component Design and Manufacturing cluster seeks to advance the state-of-the-art in both the theory and practice of precision manufacturing at large scale and to acquire and maintain the equipment and instrumentation needed to support its research agenda while supporting industry partners through applied technology development and transfer, and pursuing opportunities for external support of laboratory activities and facilities.

POWER INFRASTRUCTURE

David Young

The Power Infrastructure and Environmental Development cluster performs large-structures research on transmission and distribution designs, and materials characterization and development by use of the large-structures laboratory, T&D designs.

POWER SYSTEMS MODERNIZATION

Rudy Shankar

The Power Systems Modernization Cluster addresses all of the issues related to the implementation of Smart Grid and the impact on assuring reliable delivery of power, informing the consumer immediately of impending weather-related disruptions and speedy remediation, and managing distributed generation and energy storage assets optimally to assure high standards of reliability are maintained. The Cluster team is focused on technologies that can assist the industry in minimizing the environmental impact, operating at high efficiency and keeping the lights on.

RENEWABLES AND ENERGY EFFICIENCY

Ed Stokes

The Renewables and Energy Efficiency cluster performs research on off-shore wind, biomass and small-scale hydro technologies, integration of renewables, and photovoltaic cell and LED research. The R&EE Research Cluster seeks to be the number one resource for renewable energy research and development in the Charlotte metro region.

TRANSPORTATION ENERGY

TBD

The Transportation Energy Cluster is the latest addition to EPIC's research clusters. This cluster strives to engage the passenger and freight transportation industry to provide solutions in the context of workforce development, research and testing, and infrastructure improvement.

EPIC RESEARCH CENTERS

A wide range of research takes place through EPIC. Each Center provides specific opportunities for partnership among other universities, industry and municipalities.

CALM

Chris Hardin

The Coal Ash and Liquid Management (CALM) Office was recently launched by EPIC to develop practical, technology-based solutions for the energy production industry to address problems and challenges with coal ash and liquids management. CALM will leverage the expertise at UNC Charlotte by utilizing a wide variety of coal ash and coal combustion energy, and waste-water treatment experts. The objective of CALM is to work with a wide variety of Industry Partners, and the electric power utilities to provide the most recent technology for evaluating groundwater and coal ash impoundment stability. This will be accomplished by initiating a combination of applied research projects, and large demonstration projects that increase safety, improve long term performance and reduce cost.

CAPER

Johan Enslin

The Center for Advanced Power Engineering Research (CAPER) is a membership driven consortium among several universities and industry partners in the Southeast region of the US. The main mission of the center is to develop and demonstrate grid modernization technologies and enhance the educational experience for students in electric power engineering. With an aging infrastructure, rising demands for cleaner electricity and extreme weather conditions, the nation's utilities are working to meet these operational and planning challenges while maintaining a resilient and reliable grid. **CAPER-USA.COM**

TECHNICAL SERVICES

David Causey

Technical Services, including the Energy Environmental Assistance Office (EEAO) delivers customized client assistance with comprehensive investigative projects, grant collaborations, project management, educational outreach, feasibility analysis, verification, focus groups and surveys, conferences, training and other services. These projects help the agencies or businesses with needed assistance and that includes access to university faculty expertise, student experiential learning and laboratory resources. **EAO.UNCC.EDU**

SIBS - (NSF-I/URC)

Rob Cox

Sustainably Integrated Buildings and Sites (SIBS) is a collaboration between leading companies, corporations, universities, government agencies, and other organizations renowned for their innovative research capabilities, with the purpose of conducting research that will promote improved energy use, water use, air quality, and productivity in buildings through the integration of appropriate subsystems and technologies. The Center develops students who are knowledgeable in industry-relevant research and prepared to develop innovative products and services that enhance global competitiveness. Minimizing the impact of the built environment on the natural environment is a multi-disciplinary problem. The Center for Sustainably Integrated Buildings and Sites has recognized this need and has thus assembled researchers from across multiple fields, including engineering, architecture, and the natural sciences. **SIBS.UNCC.EDU**



EPIC EDUCATIONAL PROGRAMS

In cooperation with The Williams States Lee College of Engineering, The Belk College of Business, and industry partners, EPIC provides a series of undergraduate and graduate energy concentration and degree programs. The energy concentrations require a set of core and elective courses. Undergraduate students take four to six core courses and choose from a list of additional elective courses. The UNC Charlotte MBA is a 37 credit-hour program. To obtain the energy concentration, students are required to take four specialized courses divided into required and elective courses.

Civil and Environmental Engineering

B.S.C.E. with Concentration in Energy Infrastructure

Electrical Engineering

B.S.E.E. with Concentration in Power and Energy Systems

Mechanical Engineering

B.S.M.E. with Concentration in Energy Engineering

Systems Engineering

B.S.S.E. with Concentration in Energy Systems

M.S. in Engineering Management with a Concentration in Energy Systems

Graduate Certificate in Energy Analytics

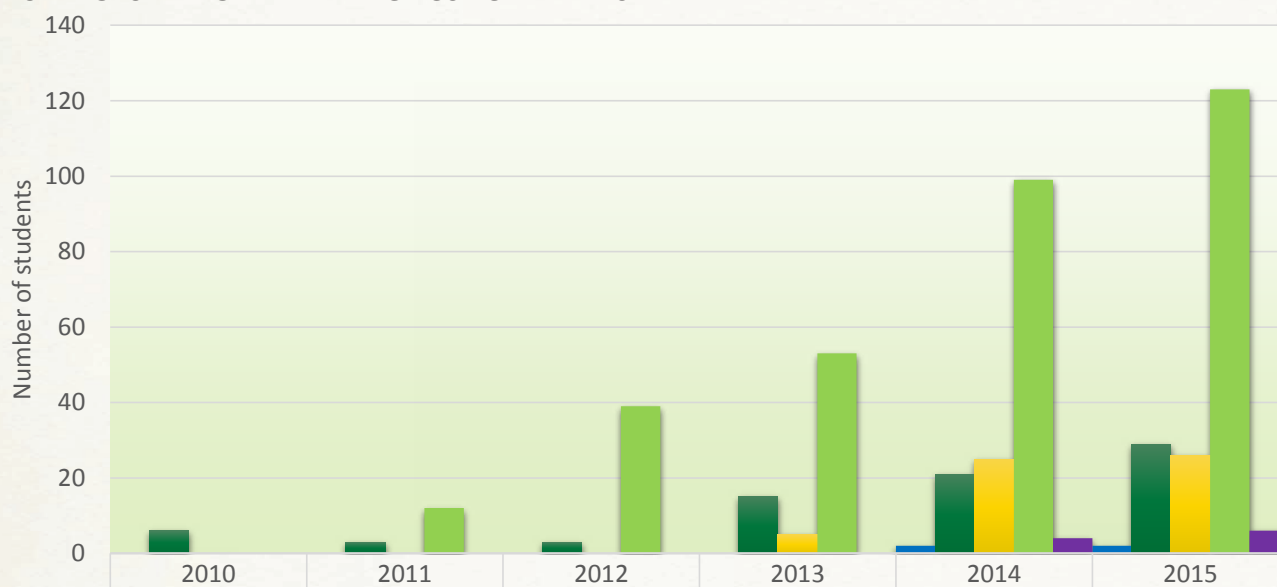
College of Business: Business Administration

M.B.A. with an Energy Concentration

College of Engineering: M.S. Energy degree

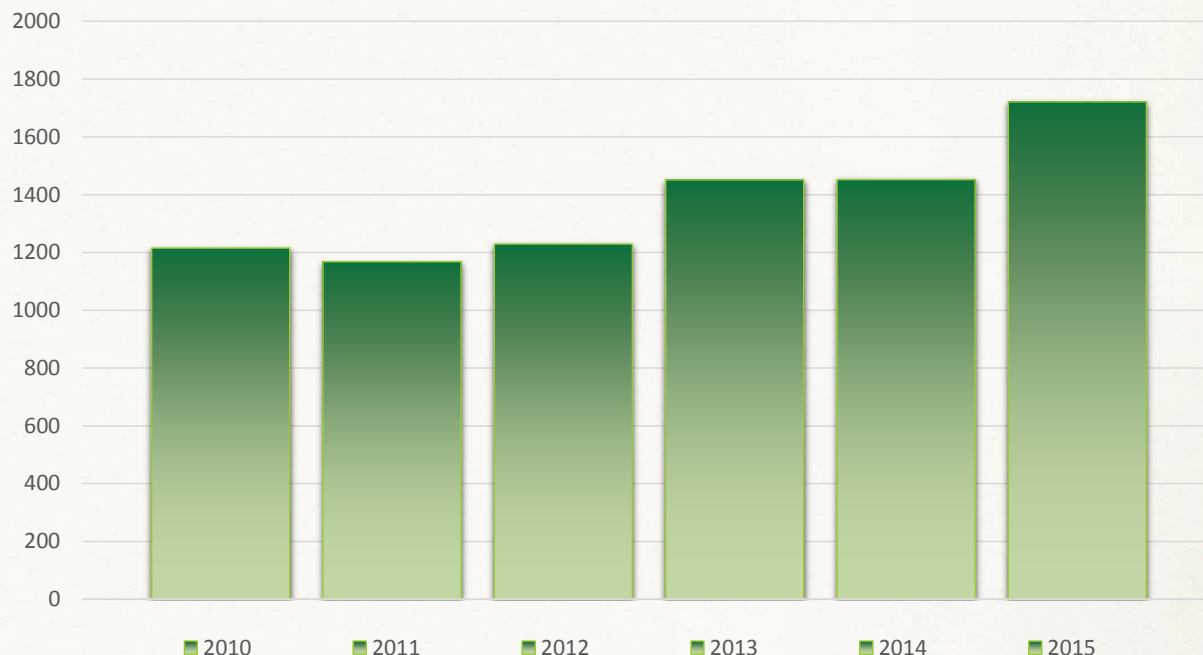
M.S. in Applied Energy & Electromechanical Systems

UNDERGRADUATE STUDENTS WITH ENERGY CONCENTRATION



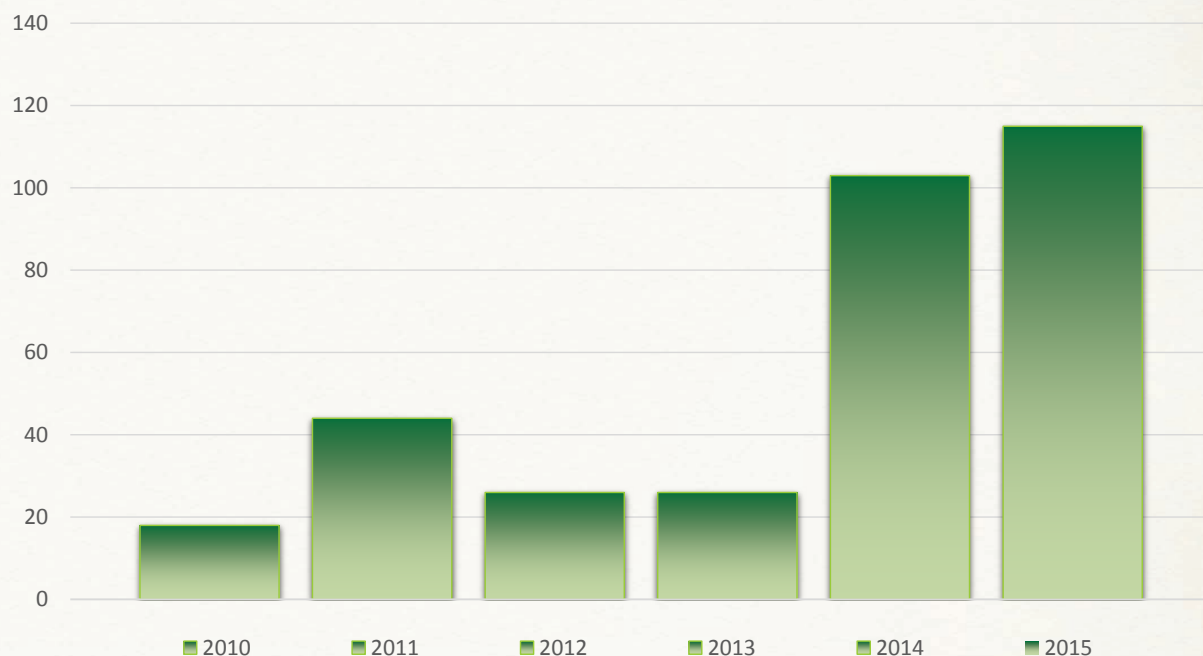
	2010	2011	2012	2013	2014	2015
Civil	0	0	0	0	2	2
Electrical	6	3	3	15	21	29
Engineering Tech	0	0	0	5	25	26
Mechanical	0	12	39	53	99	123
Systems	0	0	0	0	4	6

UNDERGRADUATE STUDENT ENROLLMENT IN ENERGY COURSES



There were a total of 1721 students enrolled in energy related courses within the College of Engineering in the 2014-2015 academic year, a 19% increase over the previous year. For Undergraduates seeking an Energy Concentration, once again Mechanical Engineering has the highest growth with a 24% increase over last year. There are a total of 34 courses across all of the engineering departments that are either core or optional courses for the concentration. Graduate student enrollment in energy courses increased from 103 to 115, this represents over a 340% increase since 2013 when enrollment was just 26.

GRADUATE STUDENT ENROLLMENT IN ENERGY COURSES



ENERGY RELATED SENIOR DESIGN PROJECTS

The Senior Design Program at UNC Charlotte provides a unique opportunity for upper level students to solve a select industry problem. Private companies work closely with faculty advisors to set the scope of work for a semester or year-long project. EPIC is particularly interested in the number of students who participate in energy related senior design projects.

During the Spring 2015 Senior Design Expo there were 75 Design I and II projects being presented. EPIC's Distribution Management System/Automatic Reconfiguration Scheme and Load Management combined team came in 2nd place among the projects presented. Supported by Duke Energy and Schweitzer Engineering, students designed and tested a Distribution Management System (DMS) comprising a Supervisory Control and Data Acquisition (SCADA) system for the UNC Charlotte CRI campus; and designed and tested a Protection and Control system for the electrical grid on UNC Charlotte's campus power distribution network.

The number of energy related students participating in the Senior Design Program grew between FY2011 and FY2015 (from 92 to 145) and the number of energy related projects increased from 24 to 32 during the same time period. In FY2015 over 41% of all senior design projects were related to energy.

ENERGY-RELATED SENIOR DESIGN

2014-2015 TOTAL PROJECTS

78

ENERGY PROJECTS

41%

2014-2015 TOTAL STUDENTS

340

ENERGY STUDENTS

42%

2011-2015 TOTAL PROJECTS

381

ENERGY PROJECTS

40%



EPIC SUPPORTED STUDENTS

EPIC supports both undergraduate and graduate students by providing research assistantships and scholarships. Students play a major role in assisting faculty members with research projects and through their work are able to gain valuable experience, making them more attractive to employers upon graduation.

At the undergraduate level, the number of undergraduate research assistantships dropped from 15 in FY2014 to 7 as the amount of funding available decreased. Scholarship opportunities supported by EPIC industry partners and UNC Charlotte were geared towards undergraduate students with an interest in energy. In FY2015, a total of 26 students were awarded scholarships which was an increase over the previous year's 14. This increase was made possible by an almost 46% increase in available scholarship funds over FY2014.

Graduate research, assistantships, and scholarships are a key component to attracting talented students interested in pursuing advanced studies. EPIC offers one graduate scholarship through the center, a \$30,000 scholarship sponsored by Siemens Energy. EPIC also provides Graduate Research Assistantships where graduate students (PhD and Masters) support faculty-led research. These students analyze data and work on higher level tasks to complete the project scope. Combined, Graduate students received almost \$1.4 million in grants, scholarships, and assistantships from EPIC and EPIC-hired faculty members.

	UNDERGRADUATE	GRADUATE
Scholarships	26	1
Scholarship \$	\$260,600	\$30,000
Students from Grants	N/A	57
Grant \$ to Students	N/A	\$254,414
EPIC Hires Research Assistants	7	9
EPIC Hires Research Assistant \$	\$40,000	\$128,813
Post Docs	N/A	3
KIT Students	5	10
EPIC Associate Students through Grants	64	127
EPIC Associate Grant \$ to Students	\$189,293	\$982,360

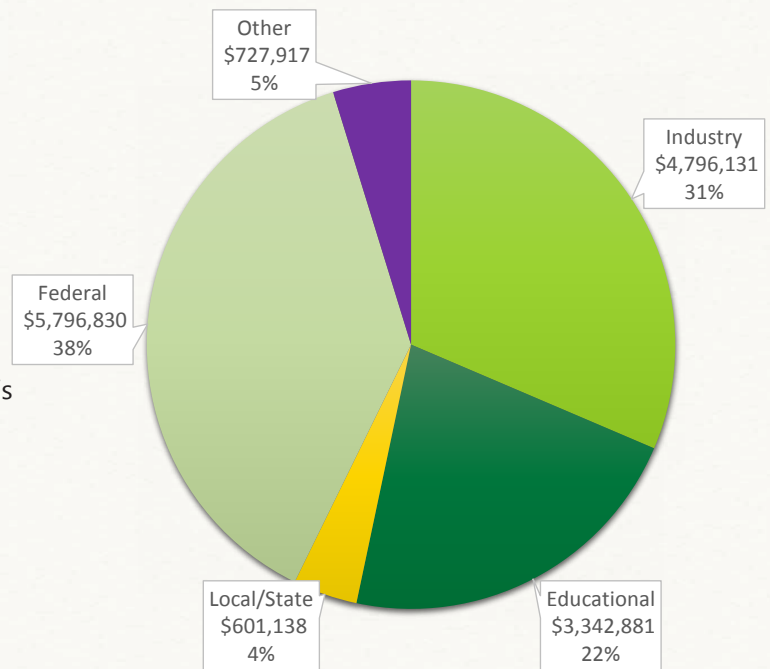
EPIC SPONSORED RESEARCH

EPIC Associates are faculty members from various disciplines across UNC Charlotte, who are experts in the power and energy field and have committed to maximize interaction among other faculty, students, staff and industry in the power and energy area. An EPIC Associate attends and takes leadership roles in EPIC activities; contributes to EPIC interdisciplinary collaborative efforts to secure external funding; joins EPIC applied research "Clusters"; serves on EPIC graduate student and center committees; collaborates on scholarly articles originating from EPIC-affiliated research; and provides advice and input to EPIC initiatives and future directions.

In FY2015 there were 75 EPIC associates who represented different colleges and departments across UNC Charlotte's campus. These associates submitted proposals for research projects sponsored by public and private sources. EPIC associates were awarded over \$15 million from various funding agencies (i.e., Department of Energy, Industry, National Science Foundation, and NC Department of Transportation). This represents a 56% increase over last year.

Since FY2011, EPIC associates have successfully increased total awarded research dollars and improved the success rate of winning projects. 39% of proposals were awarded in FY2015, which was 11% more than last year. The 19 direct faculty hires of EPIC saw a slight decrease over FY2014 with over \$3 million awarded.

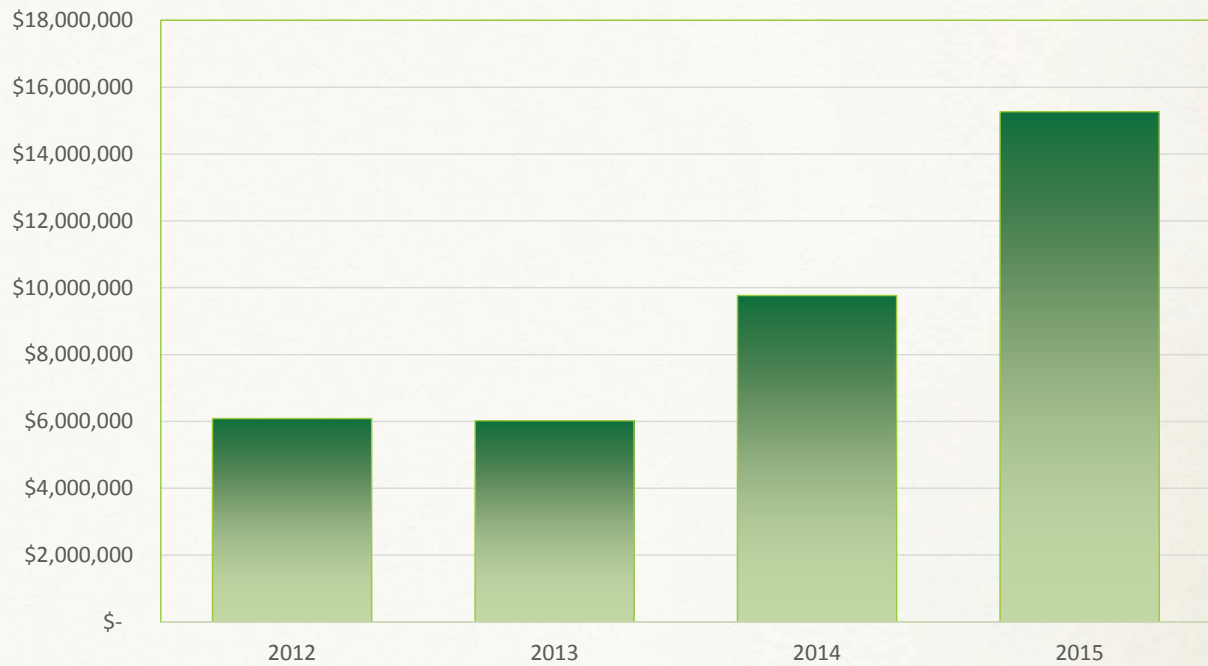
EPIC ASSOCIATE RESEARCH AWARDS BY SOURCE



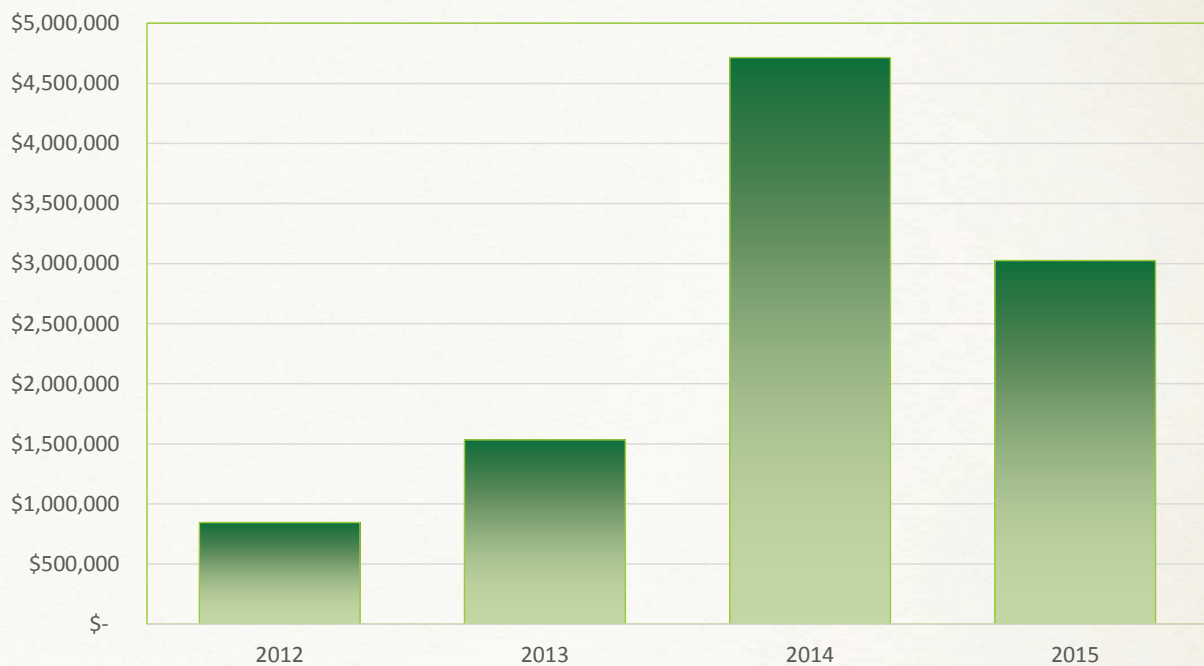
TOTAL \$15 MILLION



EPIC ASSOCIATE RESEARCH AWARDS



EPIC DIRECT HIRE RESEARCH AWARDS



EXPENDITURES

2014/2015 STATE EXPENDITURES

INCOME

Operating, Lapse, Unallocated funding **\$1,048,944**

EXPENSE

\$1,051,472

EPA Temp Staff (includes postdocs)	\$164,341
SPA Temp Staff	\$25,239
KIT Research Interns	\$7,500
Undergraduate Student RA & AA	\$52,527
Graduate Research Assistants	\$140,621
Commitments & One Time Stipends	\$67,736
Travel	\$92,471
Equipment (office & educational)	\$130,397
Supplies (office & laboratory)	\$18,859
Fixed Fees (licenses & subscriptions)	\$2,730
Senior Design Projects	\$6,000
Faculty Startup	\$67,688
Communications, Admin, and PR	\$63,162
G130 Lab Construction	\$179,201
EEAO Seed Funding	\$33,000

FY2015 DISCRETIONARY EXPENDITURES

FY15 BEGINNING BALANCE

\$21,243

FY15 TOTAL INCOME

\$21,250

Coal Ash Forum Income	\$ 7,000
Gift Income	\$14,250
Duke Energy Foundation	\$10,000
Winston Salem Foundation	\$500
SolarWindow, Technologies	\$2,500
Mesa Associates	\$1,000
Individuals	\$250

FY15 EXPENDITURES

(\$16,455)

Catering, Food Expense	\$ 8,540
CAPER Meetings	\$504
EPIC EAB & Cluster Meetings	\$1,015
EPIC Associates Reception	\$917
German Delegation	\$1,212
K.I.T. Intern Reception	\$808
Outreach & Development	\$ 7,915
Envision Charlotte Sponsorship	\$2,500
Football Tickets, Parking, etc.	\$3,100

FY15 REMAINING BALANCE

\$26,038

EPIC SUPPORT 2009-2015

CORPORATION OR FOUNDATION	GIFTS	PLEDGES
Siemens Energy, Inc.	\$4,290,000	\$4,930,000
The Duke Energy Foundation	\$4,464,650	\$4,464,650
Westinghouse Electric Company LLC	\$375,000	\$3,369,250
AREVA NP Inc.	\$2,028,000	\$2,028,000
SAS Institute	\$2,025,500	\$2,025,500
TP Solar, Inc.	\$1,153,000	\$1,153,000
Hexagon	\$1,000,000	\$1,000,000
State Match for Duke Endowment	\$0	\$666,667
The Shaw Group Inc. (CB&I)	\$411,000	\$411,000
Schweitzer Engineering Laboratories, Inc.	\$127,000	\$127,000
ZE Group	\$105,000	\$105,000
Hewlett Packard Company	\$90,753	\$90,753
The Hope E. Jamil EPIC Student Fellow	\$75,000	\$75,000
North Carolina Electric Membership Corporation (NCEMC)	\$50,000	\$50,000
PVC Holding, LLC	\$50,000	\$50,000
Boeing Company	\$40,100	\$40,100
URS (AECOM)	\$26,500	\$26,500
Energy Analytics Research	\$25,000	\$25,000
The Pinnacle Forecast, LLC	\$10,000	\$25,000
Celgard, LLC	\$10,000	\$10,000
SPX Corporation	\$10,000	\$10,000
STEAG Energy Services	\$8,875	\$8,875
Electric Power Research Institute	\$5,000	\$5,000
Mr. Bill Thunberg	\$5,000	\$5,000
Tessera, Inc	\$5,000	\$5,000
Piedmont Natural Gas Company	\$5,000	\$5,000
Hazen and Sawyer, P.C.	\$5,000	\$5,000
Electrolux	\$5,000	\$5,000
Metso Power	\$5,000	\$5,000
EnergyUnited	\$2,500	\$2,500
SolarWindow, Technologies Inc	\$2,500	\$2,500
Mesa Associates, Inc	\$2,000	\$2,000
Mooresville Rotary Club Inc	\$1,000	\$1,000
Mr. Jeffrey Merrifield	\$1,000	\$1,000
The Winston-Salem Foundation	\$500	\$500
	\$16,419,878	\$20,735,795

2015 HIGHLIGHTS

Opening of the Siemens Energy Large Manufacturing Solutions Laboratory. The new lab will conduct research on the precision dimensional measurement of large-scale energy components and was made possible with \$2 million in support from Siemens Energy and Hexagon Metrology.

UNC Charlotte hosted the UNC Board of Governors and EPIC was included in their campus tour with visits to several labs. The Coal Ash and Liquid Management Office (CALM) launched as a practical applied research and technical solutions center for coal ash and energy liquids management.

Transportation Energy Cluster created, key feature will be the Innovative Rail Technology Park and will engage the passenger and freight transportation industry to provide solutions in the context of workforce development, research and testing, and infrastructure improvement.

Center for Advanced Power Engineering Research (CAPER) update – website created, two organizational meetings held, first round of projects funded.

KIT exchange – 11 students arrived for 6 month exchange, 4 UNC Charlotte students went on a two-month exchange. Partnership continues to strengthen.

Conference exhibits and participation – NAPS (host), ECCE, Energy Inc., Energy Summit, BioEnergy Symposium (host), Charlotte Venture Challenge, The Solutions Summit

EPIC delivered numerous keynote addresses at workshops and conferences

EPIC moderated and participated in numerous panel discussions

IEEE NAPS – held September 2015, with over 280 attendees

Worked with over 55 companies on various projects

EPIC Associates developed 30 new inventions (39 since 2012)

39 Patents applied for by EPIC Associates (63 since 2012)

Over 60 visitors from companies, organizations, delegations and academia from around the world

With a renewed focus on marketing, the interest in the EPIC Energy Seminar Series attendance is increasing

CLT Joules moved into EPIC, working closely with start-up companies

E4 Carolinas is an active partner, EPIC sponsors/co-hosts many events including Emerging Energy Technology Series

Creation of EPIC database – depository for all EPIC contacts, allowing for better communication and tracking



Stick Williams of Duke Energy was the guest speaker at the NAPS Dinner.



Students use coal ash samples to conduct research.



EPIC BigDEAL students received the Outstanding Graduate Research Assistant Award and Outstanding Graduate Student Award from The Lee College of Engineering.



On May 18, 2015, four UNC Charlotte students began their two-month exchange at KIT.

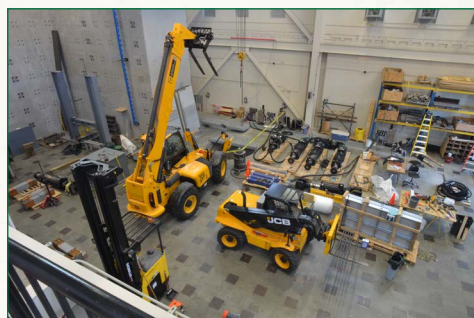


KIT students discuss the work they are doing with Minister Friedrich.

University of North Carolina Board of Governors are shown the capabilities of the Duke Energy Smart Grid Lab.



German delegates, including Peter Friedrich, Minister for Bundesrat, Europe, and International Affairs of the State Government of Baden-Wuerttemberg visited EPIC in May.



The High Bay Lab prepares for another project.

KIT students visit Duke Energy.



Congressman Hudson visited EPIC on April, 2015.



EPIC had two demonstrations at the NC Transportation Museum's Rail Days event in June.



EPIC introduced many to all of the activities and research, at the ECCE in Montreal.



Chris Hardin at coal ash site.



The Siemens Metrology Lab dedication.



Hosted by EPIC, NAPS had a huge turnout.



The University of North Carolina Board of Governors are welcomed to EPIC.

EPIC'S FUTURE

EPIC FINANCIAL SUSTAINABILITY

EPIC has multiple funding sources, including a recurring operating budget from the University of North Carolina General Administration and separate gift funds from industry partners. The discretionary budget, graciously provided by the External Advisory Board, allows EPIC to support students, host special events and meetings, purchase additional equipment and supplies, and sponsor distinguished lecturers and guests for faculty, students, and friends of EPIC.

EPIC Associates contribute significantly to the University budget through procurement of \$15 million in research dollars. EPIC is currently promoting new research relationships and partnership opportunities as a means of continuing to support EPIC and university activities.

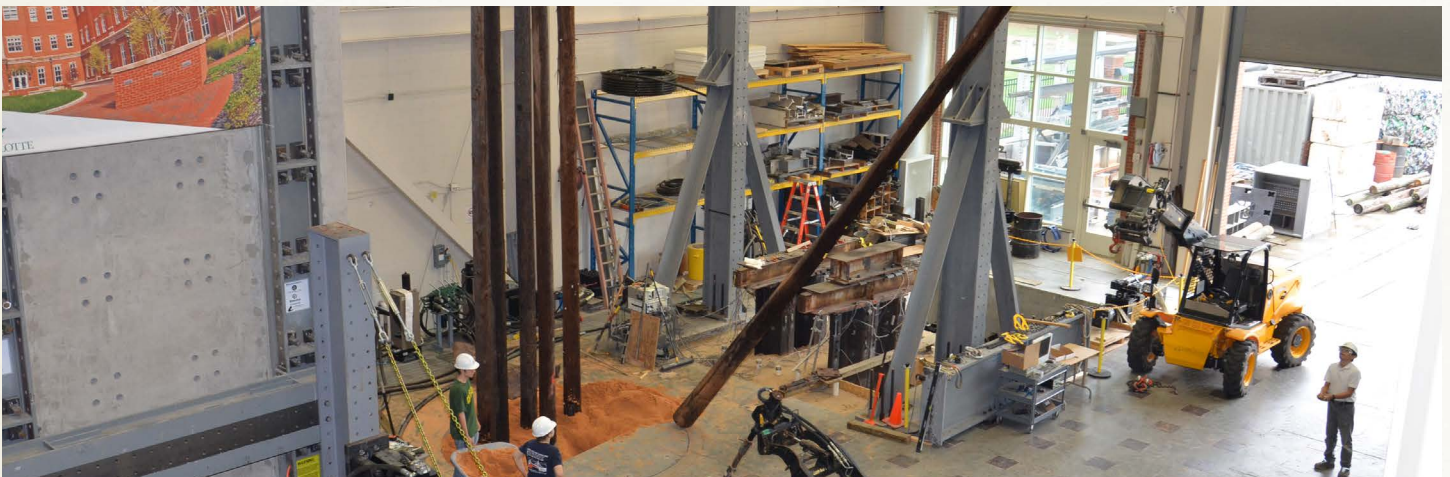
Since EPIC's creation in 2009, corporations, alumni, and individuals have gifted or pledged a total of \$20.7 million to support the center. These gifts support core functions of EPIC by supplying funds to support EPIC's three pillars: Economic Development, Workforce Development and Technology Development. Gifts are used to provide visiting faculty professorships, faculty fellowships, undergraduate and graduate scholarships, and laboratory support and equipment. Corporations also gave in-kind donations of laboratory equipment for research and teaching purposes.

EPIC MARKETING

EPIC's relationships within the energy industry community are paramount to EPIC's success and continued growth. EPIC is committed to strengthening existing relationships and reaching out to those who are not yet familiar with the capabilities of EPIC. EPIC will continue to showcase the work of EPIC through higher visibility at conferences, a focused effort to share EPIC's accomplishments with media and interested parties, and EPIC Hires seeking opportunities for collaboration.

EPIC FUTURE OUTLOOK

EPIC will continue to focus on multi-disciplinary energy educational opportunities with departments across the university. New PhD programs will be explored and efforts to further blend industry with academics, and new lab expansions will help drive cutting-edge research. EPIC Research Clusters will continue to explore new research opportunities as they work to further engage industry through the EPIC Affiliates program. The staff of EPIC will work hard to streamline processes and bring information and opportunities to students, faculty and industry.



EPIC AFFILIATES PROGRAM

The EPIC team and our Advisory Board saw the need for a long-term revenue stream for EPIC to accomplish its mission, which includes technology, workforce, and economic development, and so an EPIC Affiliates Program was formed. After careful consideration and input from the EPIC Advisory Board, faculty, and staff, a framework was developed for Program operations

Now ready to roll-out in 2016, the EPIC Affiliates Program will be composed of representatives from corporations ("members") who have purchased membership into the program. Members will benefit from EPIC's core capabilities in developing focused energy solutions in technology, workforce development, and have preferred access to students with an energy concentration. Specific deliverables to a member company will be determined by which of the three levels of membership is selected.

A partnership with E4 Carolinas will be one of the key elements of this program. EPIC Affiliate Program members will be able to take advantage of the valuable networking opportunities offered by E4 Carolinas through seminars, workshops and events, typically only available to E4 Carolinas members.

2015/16 ACTION ITEMS

EDUCATIONAL PROGRAMS

- Investigate home for INES PhD Program in EPIC
- Support new PhD program in Civil Engineering
- Investigate dual-degree MS program with KIT
- Curriculum development for MSE Degree for non-engineers
- Partner with 2+2 BS Energy Concentration with CPCC
- Provide integrated academic and industry courses

LABORATORY DEVELOPMENT

- EPRI 4160 V Drive Test-bed
- EPIC lab interconnectivity with Mount Holly
- Smart Distribution Demonstration Lab
- New CNC machine

RESEARCH

- Formation of EPIC-RWTH University, E-On Energy Center Research Consortium
- Establish new Transportation Energy Cluster

EPIC GROWTH

- Roll-out and market EPIC Affiliates Program
- Develop key industry partnerships
- Recruit five faculty and staff positions



UNC CHARLOTTE

The WILLIAM STATES LEE COLLEGE of ENGINEERING

Energy Production and Infrastructure Center

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