SUBCOMMITTEE HEARING ON MEETING THE WORKFORCE DEMANDS OF SMALL BIO-ENERGY BUSINESSES

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WEDNESDAY, JUNE 20, 2007

U.S. HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON CONTRACTING & TECHNOLOGY
COMMITTEE ON SMALL BUSINESS,
Washington, DC.

The Subcommittee met, pursuant to call, at 10:00 a.m., in Room 2360, Rayburn House Office Building, Hon. Bruce Braley [Chairman of the Subcommittee] presiding.

Present: Representatives Braley, Clarke, Davis, and Chabot (ex officio).

OPENING STATEMENT OF CHAIRMAN BRALEY

ChairmanBRALEY. Good morning. I call this Subcommittee hearing to order to examine the issues of the workforce demands in the renewable fuels industry. We have a distinguished panel of witnesses today, and I am very excited about the opportunity to discuss this very important topic.

I would first like to take a moment to thank the great panel of witnesses we have today, and I would like to extend a special thank you to my Senator, Tom Harkin, for taking time out of his extremely busy schedule to attend. His role as chairman of the Senate Agriculture Committee makes Senator Harkin an ideal witness to come testify on this issue. Senator Harkin was chiefly responsible for including the energy title in the 2002 Farm Bill and has been at the forefront of the bio-energy boom throughout his long career in the United States Senate.

Today, the Subcommittee will have the opportunity to explore the potential for sustaining the renewable fuel sector in rural America. Members will hear from expert witnesses on issues associated with industry growth and expansion as well as the need for future investment in human capital to address worker shortages.

Growth in the renewable fuels industry has been a significant stimulus for the United States economy, particularly for small firms. More than 75 percent of all renewable fuels producers are small businesses. On average, these plants employ fewer than 50 people. These small businesses have been revitalizing stagnant local economies in rural America. In Iowa, where I live, the exploding renewable energy sector is creating thousands of jobs. As of early 2005, it was projected that ethanol could create over 5,000 di-

rect and indirect jobs in my State and pay $82.4 million in wages per year.

To meet the future demand of this expanding industry, however, it will be necessary to train thousands of new workers in the next 6 to 12 months. The increasing number of job opportunities has caused concerns about access to a trained workforce. As the demand for a highly skilled workforce to operate this industry emerges, plant managers are faced with the need for skilled workers to run the high-tech bio-energy facilities that are sprouting across this country. The human capital needs that these plants will face as more production facilities come on line present a serious challenge to the biofuels industry.

The job skills needed to work in the bio-energy plants of today are much more sophisticated than the manual labor required at the grain elevators I worked at, in Iowa, growing up in the 1970s. Today's workers need computer training and lab skills to handle the increasingly complex tasks of processing large quantities of feedstocks into energy that fuels our Nation.

In the ethanol sector alone, extensive and costly on-the-job training is often required. Some States and local communities have begun to address this problem by creating training and mentoring programs at community colleges and at other institutions of learning. I believe that Congress must also take action to address this issue. We need to recognize this growing demand for skilled workers and technicians to meet the expected needs of the ag-based bio-energy sector, particularly for small businesses.

That is why I have introduced legislation, H.R. 872, the National Endowment for Workforce Education and Renewables and Agriculture Act. The NEW ERA Act would enhance the training of instructors at educational facilities like community colleges in the areas of agricultural-based bio-energy research, technology, efficiency, and conservation. We need to act now to meet this growing demand to capitalize on the unique opportunity to transform our energy economy and to improve our international security by switching our energy focus from the Middle East to the Midwest.

There is a promising future for the next generation of bio-energy, including potential growth in the evolving cellulosic industry. Exciting potential in the bio-energy industry exists in every congressional district in this country. We need to provide opportunities for the skilled workforce that will be needed to take us to the next level of energy freedom.

Despite all of the successes in the bio-energy business, we still have a long way to go. Though renewable fuels have grown exponentially over the past decade, they still make up less than 1 percent of current U.S. production. At a time when this country is facing record energy prices, it is critical that we continue to develop our alternative energy supplies. Small businesses can help achieve this goal but only if they have the skilled employees necessary to make that happen. If we truly care about the security of our children and of our children's children, we need to continue to push the envelope on the bio-energy economy.

I am excited to hear from our distinguished panel of witnesses, and I look forward to today's discussion.

Now I yield to my colleague and friend from Tennessee, Ranking Member Davis, for his opening statement.

OPENING STATEMENT OF MR. DAVIS

Mr.DAVIS. Thank you, Mr. Chairman.

Good morning. Thank you all for being here today with special recognition to our witnesses, many of whom have traveled great distances to be with us today.

I would like to especially thank Dr. Kelly Tiller, journeying up all the way from east Tennessee. It is great to see you, and thank you for being with us today.

I would also like to thank Chairman Braley for calling this timely hearing.

Renewable energy provides a great opportunity for U.S. agriculture and for rural America to be leaders in the new era of energy production. Just like most emerging industries, it will be a small business that leads the way. All of us recognize the strategic imperative for reducing our dependence on imported oil. We import nearly two-thirds of the oil that we consume. With gas prices at or above the $3 per gallon range, it is very important to discuss ways to increase our energy output to keep up with the demand.

We also recognize the immense potential for renewable energy in spreading growth, jobs and wealth creation in rural America. There can be little doubt that increased demand of renewable fuels has a great positive impact on our Nation's economy, including small business. Diversifying and improving our Nation's energy production and consumption increases competition, which we all know drives prices down, spurs innovation and creates opportunities for niche industries to crop up and to begin to thrive.

We need to promote the expansion of new plants and aid research in improving this new industry's technology. Our scientists, farmers and entrepreneurs will continue to lead the world in developing and in investing the cutting edge technology, infrastructure and farming methods. Advances in many fields will play an important role such as the continued improvement in crop yields, the optimization of crop material and fuel feedstock, the cost reduction and production of ethanol and of other alternative fuels.

With any emerging industry, there will be a period of growing pains, including the topic of this hearing—the need for additional qualified and trained technicians to build, to operate and to maintain these new plants. This phenomenon is not new. When an industry grows as quickly as this one has, there are going to be problems finding qualified employees. In this instance, I am reminded of the famous quote from the movie Field of Dreams. ″if you build it, they will come.″ I believe that, as the bio-energy industry grows and becomes more prevalent, potential workers will recognize that there is an inherent value in learning a trade specific to bio-energy production. High-paying, secure jobs are their own best advertisement. Hardworking Americans will take the positive steps necessary to fill these jobs for the future.

In helping this industry grow and prosper, we must ensure that Federal dollars are put to the best use. The artificial subsidizing of growth of this or of any specific workforce would cause potential problems in the future. With that said, I do believe that the Fed-

eral Government can and will have an important impact on helping these emerging bio-energy firms to grow.

We have asked our expert panels of witnesses to identify some of the stumbling blocks to finding, hiring and training these new employees. Meetings like this today bring people together to discuss the challenges and the opportunities of renewable energy that will pave the way for producers and consumers in the future. I look forward to hearing their testimony and to working with each of you to find solutions that best fit the American bio-energy industry.

Again, I thank Chairman Braley for calling this hearing, and I yield back the remainder of my time.

ChairmanBRALEY. I thank the ranking member, and I am very, very proud to have the Field of Dreams in my district, and any time you would like to come visit, we would love to have you.

Our first witness is no stranger to the bio-energy industry. The recent issue of the National Journal had an energy special on corn power, and included prominently in this issue was our first witness, Senator Harkin, who needs no introduction. He was first elected to the United States Senate in 1984. Iowans returned him in 2002 for his fourth term in the Senate. Previously, he served in the House of Representatives for a decade. He is currently chairman of the Senate Agriculture, Nutrition and Forestry Committee and the Committee that is currently considering the Farm Bill.

Senator Harkin has been a leader in the biofuels industry in Congress, and he has successfully worked to increase the country's production of biofuels.

Welcome to the hearing, Senator.

STATEMENT OF THE HON. TOM HARKIN, A UNITED STATES SENATOR FROM THE STATE OF IOWA

SenatorHARKIN. Mr. Chairman, thank you very much.

Congressman Davis, thanks for having me here.

Above all, thank you for having this hearing, and thank you for being on the cutting edge of this legislation to try to get the workforce that we are going to need in the future.

I have to apologize. I just got notice. I thought that our vote was going to start at 10:15. They moved it up. It actually is called at 10:11. Now, that is a rarity in the Senate. Usually, our votes are pushed back. You may be witnessing a first here where a vote actually occurred before they scheduled it.

Let me just say that as I was coming over here—let me just ask that my statement be made a part of the record.

When I was coming over here, Congressman, through the Rotunda, I looked up. There is that scene that goes around that main Rotunda of the Capitol. You see the history of the United States depicted up there. The last panel is the flight of the Wright Brothers' airplane. Right before that is the Industrial Revolution. I submit to you that we are on the cusp of a bio-energy revolution in this country, a bio-energy/biochemical revolution in this country, and it will change things as dramatically as the Industrial Revolution changed America at that time.

Now, we have got to be ready for it, just as you said, Congressman. I think both of you alluded to the fact that a lot of this would be small businesses. We think of the Industrial Revolution a lot of

times as the big factories and the big plants, but really it was in our small machine shops, in our small foundries that people experimented and devised the kinds of equipment and tools that we needed for our farms and for our mechanization in America. It was not the big plants. The big plants may have forged the steel and stuff, but it was the small plants and the small businesses that really enabled us to take advantage of the Industrial Revolution.

I think the same thing is going to be happening with our bio-energy revolution. I mentioned that picture. I also have a picture in my office, one of my favorite pictures. It is of Henry Ford, the original Henry Ford. It was taken in 1939. It is of old Henry Ford. He was fairly old at that time. He passed away, I think, in 1946. He had a baseball bat, and he was striking the trunk of a 1939 Ford to demonstrate that the trunk, made from soybeans, would not dent and would not break. That was in 1939. I also have a picture of Henry Ford wearing a soybean suit. He predicted at that time that, of the cars of the future, much of the composites of the steering wheels, the dashboards and things like that would be made from bio-based products. But what happened to Henry Ford's dream?

Well, what happened was World War II. We had to have an immense, immediate demand for petrochemicals, for petroleum to conduct the war, and then we have been living on that ever since. We just sort of have been living off of the generation of that ever since. Well, we now know what is happening. We are depleting our oil supplies. Plus, the places where we get our oil from are very unstable. As you said, Mr. Chairman, this has a lot to do with national security and what we are going to do about our national security, and you are right. We have to act now. We cannot afford to just sort of let this dribble along.

So, in order to move this—as you mentioned, we put in the last Farm Bill the first ever energy title—I have been in constant consultation with my counterpart on the House side, Chairman Peterson, and Mr. Goodlatte, Senator Chambliss on our side. We have been working on a bipartisan basis to kind of push the envelope even more on energy production from biomass. So cellulose is going to be a big part of the future.

I saw a map, Congressman Davis, of the United States and the estimates. Actually, this was a study done by the University of Tennessee, and it showed the United States in terms of increases in net farm income in the next 25 years, I believe it was. I may be mistaken there. The places where net income is going to be the biggest are the States that had the best biomass production. Tennessee was one of them, by the way, of course with Iowa, where you will see big gains because of the demands that are going to be put on us.

So, as we move ahead in all of these areas, we are going to need, Congressman Braley, what you have so appreciably, I think, thought about, and that is where is the workforce coming from. Who are all of these people going to be?

Now, if you do not mind, I will brag a little bit about Iowa. We are now number one, as you know, in the production of ethanol. In fact, we have sort of reached a milestone of energy independence of our own in Iowa. If we did not export ethanol out of Iowa, we

would have enough ethanol in Iowa to replace 100 percent of our gasoline in the State of Iowa right now. It is true.

Now, we are also building wind generators. Now we are third in the Nation in the production of wind energy. California is first, Texas and then us, but in per capita, we are number one. I always like to point that out. We are number one in wind energy production on a per capita basis, and we are building even more. We will surpass Texas very soon and probably reach California in a short time. These require technicians. They require people who know how to repair them. These are huge windmills. These are not 1-1/2 megawatts. These are 2-1/2-megawatt generators. We need the workforce, people trained not only in how to make them, to construct them, but in how to modify them, in how to maintain them, in how to work on them when they break down. So it is going to take a new kind of workforce there, then, in the biofuels with the ethanol and with cellulose coming on line.

Now, we are going to move rapidly into cellulose. We cannot meet either what President Bush has wanted or what we have in our energy bill on the Senate side in terms of renewable fuel standards. We will not be able to meet that just by corn alone. We are going to have to have cellulose. So that is going to generate a whole new kind of basis of input. How do we grow the crops? How do we process them? What are the enzymes we are going to use? What are the pyrolytic processes that we might have to use in conjunction with that? More research money is going to—and we are going to do that in our Farm Bill. We are going to put more research money into the cellulose conversion, but now again, we are going to have to think about the new kind of plants that are going to have to be built and how they are going to be maintained. Where is that workforce going to come from?

I can tell you, Congressman, like you, I visited a lot of our ethanol plants in Iowa, and you would be amazed at how many of those plants I have talked to the managers or to some of the people working there who graduated from Iowa State and who got good degrees in engineering, chemical engineering, maybe, mechanical engineering, whatever, who left the State because there were no jobs. They are now back in Iowa. They are now back because there are good-paying jobs there for them.

So I can see this as sort of a win-win-win for everyone. It is better for the environment with all of the impact of global warming that we are seeing. It is good for our national security. The more fuels we can get from our fields and trees and whatever else it might be, then the less we have to get from unstable countries that are not necessarily acting in our best interests.

Third, it is going to provide new jobs, a whole new culture of jobs and of job opportunities in our society, but we cannot just sit back and say, ″Well, fine. When they build them, you know, they will come.″ well, I appreciate the Field of Dreams analogy, but I do not just want to let these plants go ahead, because we have to do everything we can to push it as rapidly as possible. If you build the plants but they cannot get the workforce, that is going to slow everything down.

So I am just here to say thank you for this legislation and to add whatever support I can to help move it along, Congressman Braley

and Congressman Davis. I think you are on to something, and there is no better place to do this than at our community colleges. There is no better place. They are out there where the action is taking place. They have the expertise to do it. Oh, I am not saying that our universities and stuff cannot do that, too, but it just seems uniquely designed for our community college structure to be able to train, educate and to maybe even have retraining, skill upgrading as we go along because these plants are not going to be static. What we start with will not be what they are going to be 10 and 20 years from now. They are going to change and modify and become more efficient. So it is going to require a constant adaptation by our workforce to maintain those.

So I just wanted to be here to again thank you for this and to lend whatever support I can and to commend you for holding the hearing and introducing the legislation, and I hope we can get it through as rapidly as possible as a good adjunct to what we are going to be doing in the Farm Bill.

Thank you very much, Mr. Chairman.

ChairmanBRALEY. Thank you for taking time from your busy schedule. We appreciate it very much, and I hope you make your vote.

SenatorHARKIN. Oh, we will make it. Thank you very much for your leadership. It is great legislation, and I hope we can get it done.

Thank you very much, Congressman Davis.

Mr.DAVIS. Thank you.

SenatorHARKIN. Thank you, Mr. Chairman.

ChairmanBRALEY. Now we will set up for our second panel and begin as soon as we are ready.

It looks like our panel is seated. Let me just go over some of the basic ground rules.

Witnesses will be allowed 5 minutes to deliver their prepared statements. All of your written statements will be included as part of the official records of the hearing. The way that the lights work is, when you have 1 minute remaining, the yellow light will come on, and when your time is up, the red light will come on, and because we have such a distinguished and large panel this morning, we appreciate your cooperation in that regard.

I will be introducing the first four witnesses right before they give their opening statements, and then Ranking Member Davis will be introducing the last two witnesses before they give their opening statements.

So I would like to begin with John Caupert. John has been the Director of the National Corn-to-Ethanol Research Center at Southern Illinois University Edwardsville since October 2006. Prior to joining NCERC, he was the Area Manager for the North American Business Unit of Romer Labs, Inc. NCERC facilitates the commercialization of new technologies for producing fuel ethanol more effectively.

Welcome, Mr. Caupert.

STATEMENT OF JOHN CAUPERT, DIRECTOR, NATIONAL CORN-TO-ETHANOL RESEARCH CENTER

Mr.CAUPERT. Thank you, Chairman Braley.

Good morning, Chairman Braley, Ranking Member Davis and members of the Subcommittee.

My name is John Caupert, and I am the Director of the National Corn-to-Ethanol Research Center located in University Park of Southern Illinois University Edwardsville. I was just thinking what an honor to be following Senator Harkin, but at the same time it is a challenge to follow distinguished Senator Harkin.

This hearing is crucial to assure that a qualified and trained workforce is ready and able to fill the thousands of jobs being created by the biofuels industry. In order to supply this workforce, a comprehensive education and workforce training program must be developed. With more than 110 ethanol plants in operation and another 80 plants under construction, the need for qualified applicants is urgent. The need for qualified employees is now.

Our refineries are being built from the East Coast to the West Coast, from the Canadian border to the border with Mexico. With rapid industry growth, it is becoming increasingly difficult to locate employees with the proper training and educational background required to work in these technical fuel refineries.

Chairman Braley said the majority of biofuel producers, greater than 75 percent, are individual plants with fewer than 50 employees. On average, these plants do not have the infrastructure which is necessary to support thorough in-house training programs. Designers of fuel ethanol plants offer condensed training programs for the staff of a newly constructed facility.

Generally speaking, these programs do not extend beyond start-up guarantees. A comprehensive workforce training program is necessary to increase efficiency and productivity, to develop a technical workforce, to improve workplace safety, to increase environmental awareness, to minimize natural resource usage, and to reduce our dependence on foreign oil.

For the reasons stated above, the National Corn-to-Ethanol Research Center developed a workforce education and development training program. The template of our program is a 5-day, 50-hour comprehensive overview of the ethanol production process. In addition, we offer a 1-year internship program with a second year option. These programs, titled Fundamentals of Applied Ethanol Process Operations, assist in filling a void that exists in today's biofuels industry, the void of qualified applicants. Our programs ensure that the employees of the biofuels industry will not only be technology analysts, but more importantly, they will be analyzers of technology. These programs are unique in that the National Corn-to-Ethanol Research Center is the only facility in the world where a person will receive classroom instruction on biofuels, computer simulation of the biofuels production process and hands-on applied learning at a pilot-scaled dry-grind and wet-mill ethanol plant, all of which takes place under one roof.

The National Corn-to-Ethanol Research Center supports the NEW ERA as it recognizes the opportunity at hand, the opportunity being collaborative efforts between community colleges, 4-year institutions and the National Corn-to-Ethanol Research Cen-

ter. By working together, we will address the need for qualified applicants in the biofuels industry. Qualified employees of the biofuels industry will help to create energy independence for the United States of America. The National Corn-to-Ethanol Research Center looks forward to working with the 110th Congress and this Subcommittee.

Thank you.

[The statement of Mr. Caupert may be found in the Appendix on page 38.]

ChairmanBRALEY. Thank you.

Our second witness is Ron Litterer. Ron is the first Vice President of the National Corn Growers Association, and he has held various leadership positions, including Chairman of the Disaster Task Force, Chairman of the NCGA Public Policy Action Team, and President of the Iowa Corn Growers Association. As a representative of NCGA, Mr. Litterer has advocated the development of biotechnology, emphasizing the importance of responsible, accountable management by biotechnology providers, producers, suppliers, and grain merchandisers. The NCGA is a producer-directed trade association, headquartered in St. Louis, that represents the interests of more than 30,000 farmers.

Welcome.

STATEMENT OF RON LITTERER, FIRST VICE PRESIDENT, NATIONAL CORN GROWERS ASSOCIATION

Mr.LITTERER. Mr. Chairman and Ranking Member Davis, on behalf of the National Corn Growers Association, I appreciate the opportunity this morning to discuss the renewable fuels industry and the growing need for a trained workforce in the field of bio-energy.

I am a corn farmer from Greene, Iowa. I am the first Vice President of the National Corn Growers, and we represent, as Congressman Braley said, over 32,000 members from 48 States. NCGA also represents more than 300,000 farmers who contribute to corn check-off programs and 27 affiliated State organizations across our country, working together to create new opportunities in markets for corn growers.

The National Corn Growers Association applauds your efforts, Mr. Chairman, and this committee's for recognizing and addressing the critical need for a strong, trained workforce for the bio-energy industry. Today, there are 121 ethanol plants on line with 75 plants under construction with each plant creating around 40 new jobs in rural America. In my home State of Iowa, there are 28 ethanol plants with more than 1.7 billion gallons of annual capacity. These plants have created more than 27,000 jobs across Iowa, stimulating the local economies and invigorating rural development across the State.

As you may know, the ethanol industry has been one of the most significant success stories in American manufacturing over the past quarter century. From a cottage industry that produced 175 million gallons of ethanol in 1980, the American ethanol industry has grown to include 121 manufacturing facilities with an annual capacity of nearly 6.2 billion gallons.

Today, renewable fuels have become a critical part of the U.S. energy policy. As a consequence of continued high petroleum prices, regional instabilities and America's commitment to reduce our dependence on foreign oil, ethanol and other renewable energies are now a critical component in our efforts to build a strong domestic energy supply.

These developments in the biofuels industry have spurred new value-added agriculture businesses, employment opportunities and ethanol plant investments throughout our country. In the Midwest, corn ethanol has made a significant contribution to rural communities and has created thousands of jobs in much needed areas. As corn ethanol continues to grow and cellulosic ethanol begins to develop, we must have a dedicated and trained workforce to operate these facilities in all regions of the United States.

According to a study by John Urbanchuk on the economic contributions of the ethanol industry, in 2006 alone the U.S. saw the creation of 163,000 jobs in all sectors of the economy due to the increase in gross outputs resulting from the ongoing production and construction of new ethanol capacity. These include more than 20,000 jobs in America's manufacturing sector, American jobs making ethanol from grain produced by American farmers.

Again, a key component of the success of the U.S. ethanol industry over the next decade will be to ensure the industry has a ready and available workforce. Community colleges, land-grant universities and technology education centers are well positioned to train and to educate a robust and productive workforce. These institutions will play a unique role in serving both the educational needs as well as meeting the growing needs of the booming bio-energy sector by making available a dedicated grant program to these institutions.

The critical hands-on training required to operate these facilities will be available to all persons interested in pursuing a career in bio-energy, and it will provide countless new opportunities for American workers. The collaborative efforts of the industry, of the educational institutions, along with government investment will grow the bio-energy field and create good jobs and clean energy.

The National Corn Growers Association believes legislation like the National Endowment For Workforce Education and Renewables and Agriculture Act, the NEW ERA Act, will help to expand our Nation's capacity to identify and to track new jobs and skills associated with a growing renewable energy sector as well as to develop and to support national and State skill training programs that will demonstrate best practices in addressing skill shortages that have already begun to affect the expansion of renewable energy.

Already, the renewable and energy efficiency industries are feeling the pinch of labor shortages. A 2006 study from the National Renewable Energy Lab identified the shortage of skills and of training as a leading nontechnical barrier to renewable energy and to energy growth.

The National Corn Growers believes strongly in the continued commitment to build a strong domestic renewable energy workforce. Ethanol and other bio-energy technologies will play a significant role in reducing our dependence on foreign oil, in building up

hundreds of rural economies, and in creating thousands of new job opportunities across the country.

The renewable fuels industry has proven to be one of the greatest success stories in rural America in this country, bringing with it opportunity and prosperity for the American farmer.

Thank you.

[The statement of Mr. Litterer may be found in the Appendix on page 52.]

ChairmanBRALEY. Thank you.

Our third witness is Bruce Rastetter, who is the Chief Executive Officer of Hawkeye Renewables and who serves on the board of directors of the Renewable Fuels Association. Prior to joining Hawkeye Renewables, Mr. Rastetter was founder and CEO of Heartland Pork. Hawkeye Renewables operates two ethanol plants in Iowa, with a combined capacity for producing 215 million gallons of ethanol annually. On my last trip back to the district, I had the pleasure of getting a tour of one of the facilities in Hawkeye, Iowa from Mr. Rastetter.

Welcome.

STATEMENT OF BRUCE RASTETTER, CEO, HAWKEYE RENEWABLES

Mr.RASTETTER. Well, good morning, Mr. Chairman and Congressman Davis. I really appreciate the opportunity to be here today. Certainly, in growing up on a small farm in rural Iowa and being encouraged to get a good education and being able then to come back to agriculture and to see a dynamic industry that continues to grow and that offers both great opportunity and hope for our country in terms of energy and increased food production and all of the benefits that are going to come with it, I certainly appreciate the opportunity to visit with you today about your initiative on education.

As founder and CEO of Hawkeye, as you mentioned, today we currently have two plants, one in Iowa Falls and one in Fairbank. We are engaged in building two more 100 million-gallon plants in Iowa. Each of those plants employs about 45 people. As an operator, I can absolutely tell you that there is no lack of demand or interest in renewable energy in terms of jobs and people's interest in this.

As an example, when our Fairbank plant was set to open, we received over 800 applications for the 45 jobs. However, I can also tell you that it was easy to sift through those prospective hires based on the degree of education, training or experience that the applicants had. In fact, of the 45 people per plant, on an average, only seven to 10 had any degree of experience in biofuels. For the remaining employees, Hawkeye, like many other ethanol producers, has implemented wide-ranging, comprehensive training programs for each plant. At Hawkeye, we partnered with our technology provider to implement that training and education as part of bringing those employees on and teaching them some basic skills of biofuels.

Moving forward, this is an exciting industry to be involved with, and frankly, in being located in America's heartland, there is a great degree of hope and excitement about the quality of jobs being

offered as well as the overall effect of contributing to our national economy and energy security.

As with any growing industry, the biofuels industry faces a number of issues related to its continued and sustained growth. One of the most important challenges is the access to a quality workforce that is educated and trained to work in the biofuels space.

That is why I am pleased to be with you today, Congressman Braley, to discuss your initiative on training and to help bolster the education process at community colleges in Iowa and across the country.

Across the country, biofuel plants have sought to build collaborative relationships with educational institutions at all levels, be it in research and development with research universities or in training and education with community colleges like we are discussing today. The relationships between these that are active and operational in the industry with those in the educational community will provide long-lasting, positive effects on our communities.

It is also noteworthy, I think, to remember that this industry is still relatively new and is undergoing massive growth. Because of that, there is an incredible amount of work to be done in research and development with biofuels, but also that research and development will no doubt lead to more and better jobs as well. This industry will continue to grow through the use and development of additional technologies, and that will require additional education and training to ensure there is a prepared workforce for these jobs that will come on line.

A friend of mine reminded me of what happened in the oil industry years ago in Texas, in that part of our country. Because of the new discoveries, the new jobs and the new technologies that continued to develop, many educational institutions invested in training and education for jobs and research related to that industry. While the country has to continue to look for oil elsewhere today, people from around the world come to learn from the very best about the oil production and discovery space here in America.

The center of intellect and potential for renewable and alternative energy should be in America, and I would further argue that it makes sense for that to be located in the Midwest, and with the encouraging pieces of legislation like this bill, we can continue to move toward real potential as a reality of part of this industry.

Hawkeye has a great relationship with our local community college, Ellsworth Community College, in Iowa Falls. Today, with me is Mollie Teckenberg, the provost of Ellsworth. One of the initiatives community colleges are taking around this country is to look forward and to pass bond issues. Ellsworth did one last fall to fund a renewable center. Your bill is very timely in terms of additional funding towards training and education and outreach to high schools and to other parts of the community to bring those people to have interest in continuing to move forward with renewable energy and to matching programs the communities are investing in rural America today and going forward.

Thank you for your time.

[The statement of Mr. Rastetter may be found in the Appendix on page 56.]

ChairmanBRALEY. Thank you.

Our fourth witness is Dr. Patricia Keir, who is the first Chancellor of the Eastern Iowa Community College District. Prior to her arrival in Iowa, Dr. Keir spent 5 years as President of San Diego Miramar College. She was also the Executive Vice President/Provost at Lansing Community College in Michigan. As Chancellor, Dr. Keir oversees the Eastern Iowa Business and Industry Center, which offers a number of services and programs to aid local business development.

Welcome.

STATEMENT OF DR. PATRICIA KEIR, CHANCELLOR, EASTERN IOWA COMMUNITY COLLEGE DISTRICT OFFICE

Ms.KEIR. Thank you. Thank you very much, Chairman Braley and Ranking Member Davis.

I am the Chancellor of Eastern Iowa Community College District, a district which includes Clinton, Muscatine and Scott Community Colleges and incorporates small urban, suburban and primarily rural communities. Since all three of our colleges sit on the Mississippi River, our district also participates in a number of bistate economic and workforce development initiatives with Illinois, particularly in the Quad City.

I would like to address the role the Nation's community colleges can play in preparing the workforce for this emerging and exciting biofuels and ag-based products small business sector and how our participation could best be led and structured. How are we going to efficiently and effectively prepare our workforce to meet the needs that everyone is talking about?

I confidently recommend a leadership role for community colleges. There are more than 1,200 community colleges distributed across the United States. Community colleges are often the only educational institutions and, thus, the primary source of workforce training for many rural areas. No other segment of higher education is more responsive to its local community and workforce needs. Given the explosion of interest in bio-energy, particularly in the Midwest, we need to rapidly develop and deploy education and training programs to meet the emerging needs of the many related small businesses popping up everywhere.

In general, the types of jobs key to supporting projected growth in ethanol could be divided into thirds: Individuals needing short-term training; individuals needing associate degrees, technicians, and graduates with 4-year and advanced degrees. Community colleges are the starting point for all of these levels of training with their noncredit and short-term program options, their 2-year associate degree programs, and their mission to prepare students to transfer successfully into 4-year colleges and universities.

Building awareness of the small business workforce opportunities in this new field is also essential. Clearly, the U.S. needs to gear up to create and prime the pipeline with up and coming agricultural-based technicians, scientists and engineers, but today's young people and reentry adults are entering a buyer's market. There is no shortage of industries and types of business vying for their attention and their career choice. We must make career awareness of the bio-energy field a priority in our Nation's middle schools,

particularly in rural areas, since middle school years are the best times to influence students and parents regarding career choice and how to prepare for that career.

Again, because community colleges and particularly community colleges in rural areas are so tightly connected to their local K-12 systems and have articulated a seamless transition for many students in high school into college level coursework, we are well positioned to fill the pipeline with short-term certificate training to upgrade the current workforce for these jobs. There is no doubt, certainly in Iowa, that individual community colleges have already eagerly stepped up to individually develop bio-energy programs to meet local needs.

However, I would like to make the point that a more systematic, collaborative approach would streamline the process, reducing duplication or an excess of training programs, making sure everyone has access to the most up-to-date, thorough curriculum and acting in concert to be sure that we do not create an oversupply of technicians in some parts of Iowa and an insufficient number in others.

There is a model for optimum preparation of coordination and responsiveness. Through its Advanced Technology Education program, the National Science Foundation has created a system through the Nation's community colleges to educate technicians for all of the high technology fields critical to our Nation. The ATE program fosters partnerships between academic institutions and employers to promote improvement in the education of science and engineering technicians at the undergraduate and secondary school levels.

At the Eastern Iowa Community College District, for example, we host the National Science Foundation Center of Excellence in the area of energy and the environment. Our ATE Center serves as a resource and clearinghouse for curricula and training material, the professional development of faculty and program improvement strategies, and then the results of our work are shared with other community colleges throughout the Nation and, through them, into their K-12 and business partners. Reinventing the wheel is minimized, and a community college seeking to meet local training needs can quickly turn to us as a resource to implement needed programs in their local areas.

To me, America's rural landscape is a very exciting place. Our farms are emerging as primary sources of materials to address our Nation's energy and sustainability challenges. Research is showing us more and more interesting uses of biomass. Small businesses are popping up everywhere in response to this ongoing transformation. However, given the intellectual challenges of this new field and the, quote, ″depopulation″ of many of our rural areas, we must commit to choosing a systematic, efficient and forward-thinking system of bringing workers into the field and training them to meet its demands at every level. I believe that our agricultural sector, long known for feeding the Nation, will assume the role of fueling the Nation. Small business will play a key role in making this transformation a reality, located throughout the Nation, accessible to all, closely tied to K-12 and to our universities. Known to be responsive to local business and to move quickly, community colleges

should be regarded as a leader in the meeting of workforce demands of small bio-energy businesses.

Thank you very much for giving me this opportunity to share my thinking with you and my enthusiasm for the Nation's community college system.

[The statement of Ms. Keir may be found in the Appendix on page 62.]

ChairmanBRALEY. Thank you.

At this time, I would yield to Ranking Member Davis to introduce the remaining witnesses on the panel.

Mr.DAVIS. Thank you, Mr. Chairman.

Dr. Kelly Tiller is a Research Assistant Professor at the University of Tennessee Agricultural Policy Analysis Center. Dr. Tiller has extensively researched the potential of new agricultural products and the expanded uses in bio-energy to provide income opportunities for the traditional agriculture sector in rural communities.

Dr. Tiller.

STATEMENT OF DR. KELLY J. TILLER, ASSISTANT PROFESSOR, AGRICULTURAL POLICY ANALYSIS CENTER, THE UNIVERSITY OF TENNESSEE

Ms.TILLER. Chairman Braley and Ranking Member Davis and members of the Committee, thank you very much for the opportunity to be here today.

The biotechnology, biofuels and bio-energy industries have experienced unprecedented growth over the last few years, but I think most industry watchers suggest that the growth we could see over the next few years could make the past growth look like the flat part of an exponential growth curve yet to come, and much of this biofuels growth over the mid to long term is expected to be through the commercial scale development of cellulosic biofuels industries where cellulosic biomass materials from a wide variety of locally appropriate sources contribute feedstock for a range of technically appropriate biorefinery processes.

As Senator Harkin mentioned, a group of my colleagues at the University of Tennessee have recently conducted a study for the 25x25 Work Group and have provided projections of economic and ag sector impacts associated with a scenario where U.S. farms, ranches and forests would provide 25 percent of total U.S. energy needs along with the continued production of safe, affordable and abundant food supplies.

The study estimates that by 2025 we will be producing 86 billion gallons of ethanol and 1.2 billion gallons of biodiesel from America's fields, farms and forests, including the net addition of over 100 million acres of switchgrass. In total, the economic gains in the renewable energy in ag sectors plus interstate commerce top more than $700 billion by 2025 and support the creation of more than 5 million new jobs.

Achieving these levels of biofuels and particularly cellulosic biofuels would truly be transformational. Additional policies and goals supporting further expansion of this industry are also in place and under discussion right now. Taking some fairly conservative estimates of the growth in this sector, there could be required

between 720 and 1,720 operational biofuels plants spread across the U.S. in less than 20 years. By any standard or goal, with the significant advances in cellulosic skill and commercial skill, cellulosic biofuels manufacturing is required with no time to spare. As we progress toward these manufacturing expansions in cellulosic biofuels, there are four considerations that I think we should bear in mind.

First, it is important to recognize that regional approaches to cellulosic biofuels will need to be developed. We need careful assessments of regional feedstock opportunities and comparative advantages to tailor appropriate technologies and approaches for which a region has a comparative advantage.

Second, we need to remember that the cellulosic biofuels manufacturing is an emerging industry with a very infant workforce available today. Some workers have skills in other fields that will transfer well to this industry, but we still have tremendous needs as have been discussed.

Third, progressive research programs are imperative. As of today, we do not have a track record of commercially proven technology in a business model for cellulosic biofuels in the U.S. We certainly expect that to change very quickly, but it emphasizes the need for significant investments in research and in demonstration, and it is important also that these technologies and processes that are developed in the U.S. be retained through intellectual property that remains in the U.S.

Fourth, local ownership provides additional developmental benefits. To the extent that farmers and other stakeholders in local communities can be actively invested and involved in the cellulosic biofuels industry development, they can retain those economic returns in local communities, promoting further investments and improvements in education health care, social services, as well as economic development.

It is important, too, to remember, though, that farms are small businesses as well. Dedicated energy crops produced today are largely research and demonstration in nature. Achieving significant long-term growth in the bio-energy will require widespread development of entirely new crop systems and models and significant educational efforts to spread the knowledge and improve production processes.

With regard to the ag sector, I think it is important to recognize that significant research efforts are required to develop these new crops and processes. We are essentially starting from scratch. Significant research is needed in the areas of crop breeding, crop genetics, agronomic practices, crop management systems, harvesting methods, production and harvesting equipment, preprocessing, transportation, storage, risk management, and contracting, to name a few.

Second, it is important to note that sustainable systems are imperative.

Third, the energy crop solutions as well are very region-specific and must be adapted to local conditions and to local communities and resources and infrastructure.

How do we support the development of this cellulosic biofuels industry? I believe land-grant colleges and universities have a very

important role to play in the development. The three primary functions on which they are built—research, education and extension—are all critical to successfully achieving the bioeconomy vision, and integrating these functions is necessary for developing a viable and a sustainable bioeconomy. The ag extension service certainly has a long and successful track record and can contribute significantly. Investments in research to support this emerging industry are also critical to its success. Training the next generation of biofuels researchers and workers requires tailored graduate and undergraduate curricula that largely still need to be developed and implemented.

Thank you again for the opportunity to appear before you today. Certainly, bioeconomy growth is on a fast track, but it will not happen overnight. We have the opportunity now to make investments in developing and in growing a skilled and sufficient workforce and ag sector for the bioeconomy in a manner that is sustainable and that maximizes benefits especially for our rural communities.

Thank you.

[The statement of Ms. Tiller may be found in the Appendix on page 72.]

Mr.DAVIS. Thank you for your testimony.

I would like now to recognize Dr. Colin South. He is President of Mascoma Corporation, which focuses on the development of technologies for the production of ethanol from cellulosic biomass. Dr. South has over 10 years of bioprocess design, construction and operational experience in the biotech industry, acquired while he was with BioMetics Consulting. He was the former CEO of ViaLactia Biosciences, a gene discovery and commercialization company, and was Fonterra Cooperative Group's General Manager of Health and Nutrition in Auckland, New Zealand.

Dr. South.

STATEMENT OF DR. COLIN R. SOUTH, PRESIDENT, MASCOMA CORPORATION

Mr.SOUTH. Thank you.

Mr. Chairman and Ranking Member Davis, I am pleased to be here today to testify on behalf of Mascoma Corporation on this important issue, meeting the workforce needs of small bio-energy businesses. The Mascoma Corporation is a cellulosic biomass-to-energy company with offices in Cambridge, Massachusetts and research and development offices in Lebanon, New Hampshire.

Mascoma is focused on commercializing cellulosic ethanol technologies that will work in every region of the country. Fueling locally rather than trucking fuel across the country or the globe is an important component of what we see as our Nation's energy future strategy. Mascoma is developing advanced cellulosic ethanol technologies in its labs, partnering with many academic institutions to further research in the conversion of biomass, and is also developing demonstration- and commercialization-scale production facilities in several locations, including facilities in New York and in Tennessee.

As Mascoma looks to site cellulosic ethanol facilities, strong partnerships with local academic institutions play a critical role. This,

in part, comes from our beginnings at Dartmouth College in Hanover, New Hampshire, but it is also born out of necessity. Unlike other bio-energy businesses such as corn ethanol, the academic needs for cellulosic ethanol go beyond training workers to work at an ethanol biorefinery. We need individuals who can help us solve the remaining hurdles to decreasing the cost of the production of cellulosic ethanol, and our academic institutions are poised to help us do so.

Specifically, cellulosic ethanol facilities have several additional needs that require the focus of our postsecondary educational system. These include expertise in feedstock cultivation and regional agronomics with an energy crop focus, feedstock aggregation and handling, and unique processing operations of cellulosic ethanol facilities. This last part is especially important because of the variety of feedstocks that cellulosic ethanol needs to accommodate. Even within a single plant, this will require a much more sophisticated workforce.

Mascoma continues to find talent from Dartmouth and from others for our own labs in Lebanon, New Hampshire. There we are focused on the development of commercial-scale cellulosic ethanol production, including consolidated bioprocessing, fermentation development and process support. Also, in Tennessee, Mascoma is working closely with the University of Tennessee and Oak Ridge National Laboratory on the development of a cellulosic biomass-to-ethanol production facility in eastern Tennessee. Initial research conducted by the University of Tennessee's Institute of Agriculture indicates that Tennessee alone is capable of generating over 1 billion gallons of cellulosic ethanol annually from switchgrass alone. The University of Tennessee is committing research funding and lending valuable expertise to this project, and among other benefits, this project will further the economic development of the State of Tennessee, create investment opportunities for rural farmers and attract future research dollars to the State.

In New York, Mascoma is working with the State of New York to design and build a demonstration-scale cellulosic ethanol plant, capable of piloting new technologies and processes across multiple feedstocks. In addition to the State government, we are partnering with Cornell University to focus on the development of feedstock supply options and aligning efforts of academic institutions with regional development initiatives.

Policymakers have set very aggressive, yet achievable, goals for the growth of the cellulosic ethanol industry. This ambitious ramp-up in cellulosic ethanol production will require an equally rapid buildup in funding for our Nation's schools. This country's schools of higher education need an infusion of funding to continue the important research and development of cellulosic technologies.

For example, in 2003, Congress enacted and the President signed into law the Sun Grant Research Initiative, designed to enhance the efficiency of bio-energy and biomass research and development programs through improved coordination and collaboration with the Department of Agriculture, the Department of Energy and the land-grant colleges and universities. The University of Tennessee was named as one of the five regional centers to foster that critical

research. Congress should do more for this initiative and for research funding in general as it debates the Farm Bill this year.

Beyond providing valuable research, our Nation's academic institutions will also be asked to train the next generation of bio-energy workers. At least initially, cellulosic ethanol is intrinsically more labor-intensive than corn-based ethanol and will likely require twice as many full-time workers than corn-based facilities. Schools across the country will be asked to train these workers. To this end, the Federal Government should also focus additional resources on helping schools build programs and curriculum to do so.

Mr. Chairman, we applaud your interest in this area and appreciate the focus that you have brought to this issue with your legislation authorizing the Secretary of Agriculture to make competitive grants to community colleges to support the education and training of technicians in the fields of bio-energy. We think the Federal Government must do more, and I hope that this type of program can be included in the Farm Bill on a national basis.

In conclusion, we at Mascoma are excited about the future of the cellulosic ethanol industry, and we appreciate this subcommittee's efforts to help us solve our Nation's energy security needs while creating new opportunities in rural America.

Thank you.

[The statement of Mr. South may be found in the Appendix on page 77.]

ChairmanBRALEY. Thank you for that opening statement.

Members will have 5 minutes each for the questioning of witnesses. We may do more than one round of questions, depending upon what else is happening on the floor today.

Let me begin by asking Mr. Rastetter, who operates a renewable fuels facility in my district, if you can help us understand a little bit more about some of the basic demands of the workforce in operating a plant that is engaged in producing renewable fuels. One of the things that struck me when I visited your facility in Fairbank was that it was being run in a control room which had a virtual production facility that was visible on computer screens in the control room, and I think, as we start talking about the employment demands of this exciting new industry, it would be helpful if you could tell us a little bit about some of the basic components of your workforce and what you see as some of the employment needs as we move forward from here.

Mr.RASTETTER. I appreciate that, Congressman Braley.

As you walk through the plants, the first impression is that the technology advancements have been so significant that they essentially run on their own when you look at the screen, which has really led to part of the whole energy positiveness of the industry and the fast-forwarding of that, but as you dive into the quality of the workforce needed to both run those facilities, the computers, to interpret what they are telling them, you need to be able to graph and maximize whether it be in fermentation or in quality control in taking the water off so that there are not issues when it gets to the supplier, in the lab in testing the distiller's grain so that we are sending high-quality distiller's grain back to livestock feed, and understanding the protein and the nutritional value of that.

Beyond that, clearly, with all of the technology, there continues to be more of an art than a science in terms of employees' knowledge base of the basic biosciences of the quality control of the incoming corn, of the product that is presently being put out and then, beyond that, what new technology is on the forefront.

We may just employ 45 people at that plant, but clearly it is all of the auxiliary services and enzyme companies and technology providers that come and offer new technologies that we have to then either have engineers who do not have the background to always interpret or they need to go to the industry and develop.

Beyond that, one of the things I had mentioned is, with these complexes that you saw in Iowa, ultimately they will become biotech complexes. Today, we produce two products—ethanol and distiller's grain. We will use fractionalization on corn. We will be using biomass. We will be having cellulosic ethanol. We will be spinning the oil off. So all of those new technologies are going to require a workforce to deal with and to focus on that.

ChairmanBRALEY. Thank you.

Mr. Litterer, my question for you is you have a lot of members of your association who have a very thorough understanding of one of the principal food stocks that is being used to manufacture ethanol in this country, corn, but when I went back to my 30-year class reunion last year, I pulled out my high school yearbook and looked at the photograph of the FFA members with whom I went to high school, and when I went to my class reunion I asked that group of individuals how many of them were actively engaged in farming. Can you guess how many of them out of the 10 from my class were?

Mr.LITTERER. One?

ChairmanBRALEY. One. What that tells me is that there are a lot of people who I grew up with who have moved on to other components of the agribusiness segment of our economy because of their love for the land but who are not able to earn a living from farming for a lot of different reasons.

As you look forward to this new bio-energy explosion and think about the members and the children of the members of your association, what are you seeing in terms of the types of workforce choices that some of the people are making who grew up as children of members of your association?

Mr.LITTERER. Well, as you alluded to, it is quite obvious that the opportunities in agriculture are changing. Technology allows farmers to farm a lot more acres than they have in the past, and that probably is going to continue to happen, so we have to have other opportunities for our children and offspring if they want to stay in the State of Iowa and in the rural areas and stay in the rural communities. We think the bio-energy field is going to help us achieve that. So it is a good thing for our families and for our rural communities.

Beyond that, I think the thing that we see as a vision of the National Corn Growers is that starch-based ethanol probably will produce about 15 billion gallons of ethanol by the year 2015, and a lot of that expansion is front-loaded, and the uncertainty is probably on the cellulosic portion and how fast that can be economically

viable, and the cellulosic portion has a lot more job opportunities in addition to what is coming from starch-based corn.

So, to sum up, I would say that the opportunities in rural America are really enhanced by what is going on with the bio-energy expansion, and it is good for rural communities, and it is good for our rural workforce.

ChairmanBRALEY. Thank you.

Dr. Keir, one of the things that we know is that community colleges across the country are playing an increasing role in preparing students for a whole host of different occupations.

What is it about this bio-energy segment of the economy that is attractive to community colleges as we move forward in pursuing a new energy policy?

Ms.KEIR. That is a very good point because I think sometimes, when we are looking at workforce preparation in Iowa and then across the country, we have a very siloesque approach to it, so we have a lot of advance manufacturing in Iowa, and so we are trying to prepare workers for them. We are trying to prepare workers for all of the various industries, all competing for diminishing high school classes. This particular field, though, I think will be extremely appealing to young people, and we have seen in community colleges how hesitant a lot of students are to really plunge into science and math and engineering and the tougher subjects, but this, at the end, has that motivational aspect of something new and exciting, and it is good for America, and so I think our biggest challenge here with such low unemployment, at least in Iowa, is to really clarify what is involved in this industry and why it is exciting and get down into the middle schools and start filling the pipeline.

When I heard someone say that we needed to fill the workforce in 6 months, that is kind of frightening because even community colleges, which can turn on a dime, cannot go from nothing to a fully trained technician in 6 months. There is a curriculum development and things that have to be done with the business, but I think this is going to attract a lot of students if we promote it correctly, and I think we can more than meet the need.

ChairmanBRALEY. Thank you.

Mr. Caupert, one of the comments you made that really struck me was when you were talking about the role of your program you were talking about the void of qualified applicants; and as I was listening to Mr. Rastetter's opening statement it sounds to me like the key emphasis of that phrase was ″qualified.″ because it appears that there is no lack of applicants in rural America for the job opportunities that are being created by the biofuels industry, but the real critical component of that is creating opportunities for qualified and skilled workers to fill the need.

Your program has been on the cutting edge of identifying a need, trying to provide training and educational opportunities. Can you talk a little bit about how this idea formed and how you went through the difficult process of identifying what type of skills and programs would be necessary to provide skilled workers in this sector of the economy?

Mr.CAUPERT. Absolutely. Great question, Mr. Chairman.

Our phone rings off the hook every day from folks just like Mr. Rastetter saying, do you know somebody out there that is qualified? We have a phrase at the National Corn-to-Ethanol Research Center that this biofuels industry— ″There is a need from GEDs to Ph.D.s.″ The need is out there. What is lacking is the qualified person.

We can bring somebody to the National Corn-to-Ethanol Research Center, and within 48 hours we can make that person an analytical technologist. We can put them in our pilot plant, and they can start pulling samples of ethanol off of a distillation column and inject it on HPLC, and they can get a number, they can record a number. That is an analytical technologist.

The need is for those folks who can actually analyze the analytical technology, and that is what our program is doing.

In addition to recording a number, they are analyzing that data. What does 14 percent alcohol versus 18 percent alcohol, what does that mean? To Mr. Rastetter's ethanol plant, that means 4 percent more ethanol yield per year, which is millions of dollars in production. That is the difference.

How did we start this collaboration? Simple. We worked with a number of community colleges and 4-year institutions to apply for an NSF grant. We didn't get it, but we weren't disappointed. Because what grew out of it was a collaborative effort in which young folks are coming out of community colleges, 4-year schools, trade schools, vocational tech programs, coming to our facility and going through these intense programs. We can't keep people in-house long enough before enzyme manufactures, yeast companies, and ethanol producers hire these folks away.

ChairmanBRALEY. I have some very important questions for our other two panelists, but I would like to give Ranking Member Davis the first opportunity in asking you questions. I yield the time at this time.

Mr.DAVIS. Thank you, Mr. Chairman.

Dr. Tiller, you mentioned the need to develop region-specific energy crop solutions. What types of crops do you foresee could be used across the country?

Ms.TILLER. I think it varies tremendously by region, and that is one of the reasons that the Sun Grant Initiative which Dr. South alluded to earlier was developed as a regional research approach to harnessing the land-grant system and identifying what these specific advantages are, region by region.

So, for example, in the Southeast, if you look—and Senator Harkin mentioned, too, the maps he has seen for projections for switch grass and other dedicated energy crops. Because of the climate, the growing conditions, the infrastructure we have in place, I think in the Southeast we have tremendous comparative advantages in some dedicated energy crops like switch grass and perhaps some others that are being examined as well but similar in nature, the short rotation woody crops, hybrid poplars, other things like that. Forest biomass resources is certainly very important in the Southeast.

As you move across the Nation, the particular advantages change a little bit. So do the infrastructure requirements, the training and know-how to improve those entire systems of production. But I

think that, throughout the country, dedicated energy crops and forest crops specific to that region are going to be important. And as far as whether it is, you know, camelina, lesporilla, metham—who knows what these oilseed or other crops are going to be in the future—I think that we have a lot of research still to go to determine exactly specifically which crops are best suited to each region.

Mr.DAVIS. As we move forward as a Congress and try to come up with a national solution, do you feel like we need to limit it to one region and one product? Or do you think we need to be looking at all regions and different products as we look to educate our workforce for the future?

Ms.TILLER. I think it is very important that we look to all regions and try to identify specifically what those needs and advantages—comparative advantages are in those regions. I think that we need a fairly careful and thorough assessment to help guide those regional approaches, but I do think that we would do ourselves a disservice if we focussed specifically on one region, because the needs and the resources available are so diverse.

Mr.DAVIS. This appears to me to be a very science-intensive undertaking that we are talking about. Are we doing a good enough job in K-12 preparing our workforce for the future, in your estimation? And leading from the K-12, do you feel like we ought to limit our help to just community colleges? Do you think we ought to be looking at land-grant institutions? Universities?

Ms.TILLER. Well, I think that one of our successes historically has been this very integrated, broad approach that we have to our educational system. I think it starts early, and it continues on, and I think that all of the different approaches are a good fit for particular needs.

I do think in the case especially of the future as we look toward cellulosic biofuels, I think that the role that the land grant universities and the postsecondary schools can play is tremendous. I think that the integrated research, education, and extension—so not only doing the research in these research institutions but also bringing students into the labs to work with the researchers, to integrate that information into the courses that are being taught at the graduate level in particular, and the opportunity then to work through extension and take that information out to the public being—I think that is a tremendous advantage and going to be a very important approach, although part of an integrated approach that starts K through 12 in moving this forward.

Mr.DAVIS. Looking back at K-12 just a little bit, I know there are programs in vocational education, Future Farmers of America, FFA. Do you know if they are starting to integrate this into their training?

Ms.TILLER. I am only aware of some local programs that we have in east Tennessee. We have a Young Biodiesel Leaders Program that our clean cities group, East Tennessee Clean Fields Coalition, has started where they go into high schools starting as young as sixth grade and work with the students to educate them about alternative fuels, how they can use them locally. They then go and educate their bus drivers about potentially using biodiesel in their fleets and others in their community.

So there are programs. I am not aware of others except some that are very local in nature.

Mr.DAVIS. Moving a little bit from education over to industry, do you know if any of the major agriculture firms like John Deere are helping assist with financial benefits of moving in this direction in agriculture?

Ms.TILLER. Certainly agribusinesses look down the road and see this as their future as well. So, yes, I think that they are recognizing the opportunities that they have today to invest in this area and are looking for opportunities to do so.

Mr.DAVIS. Dr. South, I know that you are based in the Northeast, and I am certainly glad that you are working with the University of Tennessee and Tennessee in particular, but it sounds like other States as well. Why did you choose Tennessee, why did you choose New York, and why are you looking across the country?

Mr.SOUTH. The commonality between New York and Tennessee that was seen as some great leadership at the Governor level, the State level—we have certainly seen a commonality between those two States with leadership at the State government level for promotion of the programs. They both see themselves as States that have an opportunity with regional biomass availability and also the opportunity to lead in the field of Tennessee in particular. The Governor's budget from Governor Bredesen has a significant commitment in both the establishment of the biofuels industry at the grassroots level through initiatives with farmers, through initiatives with the University of Tennessee to develop the actual dedicated energy feedstock and a commitment to manufacturing.

So I think the overall vision of needing to address the issues in cellulosic ethanol across the value chain rather than just at specifically targeted initiatives is a wonderful space to be. When we look at that biomass map the places that can grow it reside Northeast, Southeast, through those biomass growing areas. And the vision of Tennessee particularly against that is a wonderful thing, and it has led to our great deal of interest.

Mr.DAVIS. If you were a K-12 student looking to move forward in this industry, where would you be looking? Would you be looking with just a high school diploma? A community college? Would you be looking to university, on-the-job training? Where do you think the jobs in the future are going to be?

Mr.SOUTH. I believe when we look at the jobs in the plant, those screens that you look at when you run a process plant, be it an ethanol plant, a cellulosic ethanol plant, a chemical plant, the challenge is not to look at the data and control the plant, because the plant is designed to control itself. It is to look at where the plant is going. It is not what is now. It is the interpretation of what will happen in the future.

And those skills as we have alluded to before really come from that in-depth understanding of processes. It is not a K-12 level. It will happen at the community colleges, and certainly the leadership and the development of those cellulosic programs to take the next step between two substrates and new processes will definitely be developed out at a university level.

Mr.DAVIS. Thank you.

ChairmanBRALEY. Thank you.

Member Davis mentioned something that is very important to my district, a company called John Deere. One of the things that you can find if you go to the Smithsonian Institute is the Waterloo Boy tractor, which was originally started by the Froelich Tractor Company, the first gasoline-powered tractor in the company in Froelich, Iowa, which is also in my district. Thank you very much for giving me that opening.

There are four John Deere production facilities in my hometown of Waterloo, Iowa. They have a big industrial equipment manufacturing facility in Dubuque, Iowa, also in my district; and the world headquarters is in Moline right across from my district in Davenport, Iowa.

Dr. Tiller, one of the things that you mentioned was the need for progressive research models to deal with the feedstock diversity that we see across the country; and what I would like you to do, if you wouldn't mind, is elaborate a little bit on what you meant by that.

I think one of the things we are looking for is education and training programs that are uniform in some applications but also are flexible enough to deal with the diversity of feedstock we are going to be seeing, especially in the emerging cellulosic industry and other bio-energy production facilities.

Ms.TILLER. Sure. I think that we are going to see tremendous change over the next few years and what we envision today is not going to be anywhere close to what things will look like in 10 years. I think they are continually evolving, and it is important that we recognize that. They are also very specific to those local resources.

But one example that I think points out some of the challenges is the experience we have had over the last few years with some pilot production trials for switch grass as a dedicated energy crop. To begin with, the farmers who are planting it called their extension agents a few days after planting to ask exactly what they were looking for; and the response was, well, look for something in a row.

The point is, we really know so little about a lot of these feedstocks right now. So we are starting from the ground level. We need—I think we start from the place where we are, which is using the existing equipment and infrastructure and knowledge base we have. But we have a long ways to go to optimize that and to refine those processes and the management and the harvesting, the transportation, storage, logistics, all the various aspects that go into turning something from a crop into a feedstock. We have a long ways to go to wind up with a very efficient system.

And it is important, too, I think to note that, right now, the model for the cellulosic ethanol biorefineries, about half of their costs are tied up in getting the feedstock to the plant and ready to use.

ChairmanBRALEY. Dr. South, one of the things I am very proud of is that I graduated from Iowa State University, the birthplace of the digital computer and also home as a graduate student to George Washington Carver. One of the things that George Washington Carver taught us was that there are endless opportunities to derive benefits from plants. And having grown up in a State

where my parents both grew up on farms in Iowa during the Depression, my family has been farming and teaching in Iowa for over a hundred years, one of the things that is always a huge part of the agricultural experience was a very strong sense of stewardship.

When I look at some of the research that is taking place around the country, including at Iowa State, and looking at a diverse variety of feedstocks even outside this country that could be used to try to reduce not just America's dependence on petroleum-based fuels but the world's dependence on petroleum based fuels, one of the things I am interested in is how do we take some of the education and experience in this bio-energy industry and transfer it across the world to developing countries who are under the oppressive hold of petroleum-based energy producers and are being kept back in their own economic development? I am interested if you have any thoughts on how we can move to that level as well.

Mr.SOUTH. I think the key to moving to that level is the establishment of the industry. There is just so much latent demand. We have interest all over the world talking to us about how do we develop this industry in our country. And the challenges even in a developed country like the U.S., where there is a lot of incentive, a lot of market pull for this material, we need to put in place those things that will bootstrap the cellulosic ethanol industry and meet some of our own goals. Because the proof of concept of this industry will be when we have multiple biorefineries running 24/7 and producing cost-effective ethanol.

When that happens, not understating the ease in which it can be done, but the pull that is coming from those countries that are talking is already there. The researchers, the investment, it is already waiting to happen. The biomass growth areas of the world through the equatorial regions are the areas that are ideally suited for biomass ethanol, and they are ideally suited to be cost-effective in doing so, and they have a real need.

The issue is going to be again around the types of thing that Kelly was talking about. There is from one end to the other of this value chain a need to move it up a step, to take it to a commercial application; and it needs to be fostered in a way that we get through the transition period into that commercial application.

ChairmanBRALEY. Thank you.

Mr. Rastetter, one of the things that all of us in the Small Business Committee are very interested in is the impact on Main Street of the decisions that we make here in Congress. What I would like you to do, if you would be willing to, is share some of your observations about how ethanol producers in Iowa and around the country have had an impact on Main Street merchants, stores and the communities that you serve.

Mr.RASTETTER. One of the interesting aspects of it is just all the facets that it impacts.

To Congressman Davis' earlier question about people teaming with FFA, the Renewable Fuels Association has started funding significant curriculum development with the FFA group to hit all the facets that you think about. If you think about the impact of biofuels, it impacts agronomy and stewardship of the soil and research having to do with the amount of stover that you can take off of eventually. So that we are prepared for cellulosic ethanol to

biotech genetics on corn, to precision farming on GPS from John Deere, to local dealers from a transportation standpoint instead of a market where we ship corn overseas and a unit train creates a couple of jobs. We have hundreds of new jobs created in logistics and management of that, whether it be from actual truck driver to the education aspect.

To communities like Fairbank, Iowa, where we spend $110 million in a community of 400 people, that on a per capita basis would be unheard of. That for the next generations to come that plant will be producing some form of energy. And it may not be exactly what we have today, but it will transverse and continue to develop, to education, to people having interest.

The comments that—we have hired half a dozen engineers that range from working in Oman to South America, that have come back to Iowa that graduated from Iowa State, to farm kids who got jobs around the country. So from local businesses and all the infrastructure created in the turnover, to corn farmers who now have land values that have increased over 20 percent because they don't need government subsidies to survive when they have a price that is reflective of the value. To now an infrastructure and investments that will continue to increase yields and the technology and starch levels of corn that will allow us to extract more ethanol from that corn, to livestock producers who are now doing research and substituting distillers grain for corn and soybean meal they previously have had.

It is really hard to describe in detail out the facets of it, but within that there are literally hundreds of jobs created. When you think about a plant our size that eats 39 million bushels of corn and sends a third of that back to livestock feed, ships the rest to add to fuel and the ensuing benefit to the economy that happens.

ChairmanBRALEY. The States of Iowa and Ohio are sometimes confused by people on the east coast and the west coast. But the State of Ohio has a great combination of rural parts of the State, great educational institutions, and a great manufacturing history. So I am very pleased to yield to the ranking member of the full Committee, Steve Chabot, and would ask him to share his comments or questions with our panel at that time.

Mr.CHABOT. I thank the chairman for yielding.

I would just note that clearly the best part of Ohio is around the southern part of Cincinnati, which happens to be my district. But I do appreciate the substance of this hearing, and we have been ably represented by the gentleman from Tennessee, Mr. Davis.

I don't have any specific questions, but I would just comment that this is an area that I think is critical to the future of our country and our reliance upon energy and how important it is. This whole area that you all have been discussing today is of the utmost importance, so I want to thank you for holding the hearing.

With that, I yield back the balance of my time.

ChairmanBRALEY. Thank you very much.

Mr. Caupert, one of the follow-up questions I had for you, as you look for people coming into your program right now, can you give us a little more detailed sense of where those people come from, the types of backgrounds they bring, and what varying levels of training they need once they show up at Edwardsville?

Mr.CAUPERT. Great question, Chairman Braley; and we thank you for it.

As I mentioned before, the folks who are working in this industry they literally change from the GEDs to the Ph.D.s; and that is what we see come in our doors.

One of the programs that we are most proud of is a program that we launched through a wired grant in January of this year in which displaced workers, a group of people that we have not even touched on today, but displaced industrial tradespeople from the automotive industry in Michigan and other places around the country are traveling to our facility so they have something that they can put on their resume to relocate them, if you will, and find a good-paying, quality job.

We range from that to people from Dartmouth and MIT. The folks from Mascoma have visited our facility. Really, the sky is the limit in the types of people that come to our program.

One of the things I would encourage everybody to do in free time is to read the exit interview of one of our recent interns that I included in my written testimony. Billy Whitlock came out of Michigan State university as a young chemical engineer who was full of theory but had no applied experience whatsoever. I remember Billy's first day because his first day coincided with my first day. And he looked at me and he said, John, so that is what a pneumatic pump is. And I think that tells the story pretty comprehensive about our program.

ChairmanBRALEY. Dr. Keir, one of the things that we know about educational institutions as a whole is they are constantly attempting to try to identify emerging needs for education and training; and meeting the demands of a highly skilled workforce will be an issue that is an ongoing concern in the renewable fuels industry and renewable energy industry. As you look at the role of community colleges in that mix, how do you foresee future trends impacting the type of flexibility you need to provide in the curriculum that you are offering?

Ms.KEIR. That is also a really good question.

One of the things that I wanted to talk a little bit about is the need for faculty development and the development of ever-changing curriculum that is being offered to middle school, community college, and 4-year university faculty. The program that we have, the A tech program, we partner with MIT and Iowa State and several other research industries; and what our job is to take the new scientific knowledge or the new engineering knowledge that is pretty much un-understandable to most people—I needed a lot of tutoring just to do this—and transform it into curriculum that then is available throughout the Nation to community college faculty, to community colleges and to K-12. So some sort of funding and system so that you can continually quickly refresh your curriculum is absolutely essential.

I think the point I was trying to make earlier, too, is that everybody finds this very exciting; and so every community college in Iowa has stepped forward. So we have programs sprouting up everywhere. So there is a lot of duplication and not enough collaborative, systematic sharing of curriculum and faculty development.

ChairmanBRALEY. Thank you for your participation today. It was good to have you here.

One of the things that I am interested in, Mr. Litterer, is the impact on profitability and opportunities for success for farmers that the renewable fuels bio-energy industry is providing. One of the things we know is that there is a significant amount risk that farmers are exposed to every year: price dynamics, unpredictable weather and many, many other variables. Can you talk to us a little bit about how renewable energy production has become a form of risk management for farmers by allowing them to diversify their investment?

Mr.LITTERER. Thank you, Chairman. Yes, good question.

As you are well aware, a lot of our members are also investors in ethanol plants. So they have taken a piece of ownership, if you will, into an alternative way to market their corn. So, for them, it has become a win-win deal. They can either sell into the marketplace or get a return through their investment in the ethanol plants. So that has been a very important aspect.

But, more importantly, I think going forward it has basically driven the demand for corn and not just corn, all commodities. It has helped raise the price level of all commodities not just in the United States but worldwide. This is a beneficial thing worldwide for farmers. We don't operate in a vacuum in the United States in producing corn. There are other areas in the world that are doing corn production, too: Argentina, Eastern Europe, South Africa.

And then that is going to create demand for the wheat, the other feed grain, to feed the livestock industry. So it is a complex question. But what has happened is good for farmers around the world.

I think, as Mr. Rastetter alluded to early, we don't have to rely on a government subsidy because of low corn prices. This is creating a unique opportunity in our business. Again, just the price of the commodity itself but also the investment possibilities and opportunities that we, as farmers, are operating in this growing industry.

ChairmanBRALEY. Well, this has been a fascinating hearing for me personally. One of the reasons that I am so excited about the subject of the hearing is that it combines three of my passions: education, agriculture and energy.

What I would like to do is get each of the panelists, starting with Dr. South, 1 minute to just wrap up and tell us what message you would like us to take away from this hearing as it relates to your individual testimony, what you would like to see us be doing in Congress in this area. But just give you an opportunity to close with some closing remarks.

Mr.SOUTH. Thank you.

Firstly, thanks for the opportunity to speak today. It is an important topic to us, obviously.

I think the requirements for education across the board in this sector are huge. To be the industry we aspire to be in terms of this impact on U.S. energy supply, if we just take the percentages and multiply across against what the R&D that goes into the petroleum industry is versus what it would be against what is our nascent cellulosic industry and project those down into the requirements we are going to have across our postsecondary school education, I

think we have major challenges ahead of us. The great thing is there is a lot of focus coming in now, and we applaud the leadership that is being shown by the Committee in doing so.

From our perspective, the most important thing we are going to do to hone the requirements for this education is get on the ground as quickly as possible and get the operational experience that can really drive out operational excellence in manufacturing and bringing new technologies through to market.

So, from that perspective, the right things are being done. We need to make sure that we can actually establish the industries and meet some of the very, very aggressive goals that the U.S. Congress is setting for us.

Ms.TILLER. Thank you.

I think that as we look toward the future and the bright opportunities that a cellulosic-based ethanol and biofuels bio-energy bring in addition to the existing renewable energy sector that we have, it is important to recognize that there are really two stages; and I certainly applaud you for looking ahead to that second stage where this industry is well developed and well on its way to achieving those goals. But there is a precursor to that, and I think the land-grant universities in particular have a real role to play in the research and development and deployment of those technologies that are required in order to achieve that future vision.

I think also it is very important to remember as we move forward that this is likely to develop as a very region-specific approach, and we need to be sure that we are evaluating those region-specific advantages and moving forward in region-appropriate ways.

Ms.KEIR. I would reiterate the need to be very systematic about this, to find a way to share the knowledge and not end up with a lot of duplicative training programs in community colleges and K-12 that haven't been informed by the science, finding ways, as in the New Era bill, to have some champions and organized structure and then to have a structure for training at all of the levels that is very quickly infused with the new knowledge that is going to come up.

And I also want to agree that, while the community colleges, particularly because of their location and their workforce development emphasis, are really a good place to center the leadership or the forward momentum of this, none of this will happen without partnerships with the research universities and the land-grant universities because that is where the new knowledge is going to come and continually infuse. And none of is going to happen without a partnership with the K-12 sector. That is where we will motivate young people to prepare and be interested in these careers when they have so many other choices now in the United States.

Mr.RASTETTER. From a public policy standpoint, the government has asked private industry and agriculture to develop the biofuels industry. We have responded with that. The industry has invested literally billions of dollars to support that commitment. And as we look to touch the broad sectors of agriculture all over the country as it moves into cellulosic ethanol, biomass, energy savings, agronomic work, education and curriculum, and the ability to have a fluid program that is free of government bureaucracy when commu-

nity colleges need to have flexibility as those curriculums change and as land-grant universities and research universities need to downstream that technology improvements and information is going to be critical.

So the machine is working. The train is leaving the track and is clearly responding to the national call, and if you can overlay that with education benefits you are going to see long-term generational benefit to the country and energy independence.

Mr.LITTERER. Just to reiterate a couple of points already made. I think this whole energy bio-energy field is going to be an evolution. In other words, we are not here today and that is the way it is going to be down the road. It is going to evolve. Part of that is going to be cellulosics building on even with corn. Corn can contribute significantly with the cellulosic portion and the fiber and the kernel and some of the corn stocks and cob so forth.

So I think the educational part of this is going to be an evolution in all these things that are going to change because we are going to an evolving industry.

Secondly, and it wasn't mentioned today because we are focusing on energy, but biorenewables. I was at a grand opening of a plant in Loudon, Tennessee, and that plant is producing high-fructose corn syrup, ethanol, and it is producing polymers. Polymers, those are starch based from corn there. But they are also going to have great potential in the future, too; and it is something that our educational institutions are going to have to pay attention to.

Mr.CAUPERT. Mr. Chairman, there are four things.

Number one, there is no shortage of people that are available to work in this industry. The shortage is of qualified people.

Number two, training clearly needs to go beyond textbook learning, need to be applied learning.

Three, I completely agree with Dr. Keir that there certainly needs to be more collaboration and a systematic approach to the education and training that takes place.

And, finally, the biofuels industry does not know State borders. Therefore, the education and training that takes place needs to be national in focus irregardless of ZIP Code.

ChairmanBRALEY. Thank you.

Member Chabot, do you have any final remarks that you would like to share with the Committee?

Mr.CHABOT. No, just, once again, I thank the panel. I will review the testimony they have given today, and I thank you for holding the hearing.

ChairmanBRALEY. The final comment I would like to share with everyone here is one of hope. When I go home to Waterloo, Iowa, on the weekends I look right across the street and I see the house that Jessica Lange lived in when she came to film the movie ″Country″, which was an attempt to capture the despair of the farm crisis of the 1980s. And as I drive around the countryside in my district and I see the Hawkeye renewables ethanol plant in Fairbank and I see new energy and focus throughout my district, throughout my State, and as someone who grew up in a small town of 1,500, working on farms and in grain elevators, it is very, very exciting seeing people taking control of their destiny.

We in Congress need to help them by helping provide the next generation of education, training and experience to make sure that we can be moving in a new energy focus and that we can transfer what we learn throughout the world to reduce our dependence on petroleum-based fuels.

So I thank all of our witnesses for coming; and, before we adjourn, I ask unanimous consent that members have 5 days to submit statements and supporting materials for the record.

Without objection, so ordered.

The meeting is now adjourned.

[Whereupon, at 11:45 a.m., the Subcommittee was adjourned.]

June 20, 2007

STATEMENT
of the
Honorable Bruce Braley, Chairman
Subcommittee on Contracting and Technology
House Committee on Small Business

Hearing on Workforce Demands of
Small Bioenergy Businesses

I call this subcommittee hearing to order to examine the issue of workforce demands in the renewable fuels industry.

I would first like to take a moment to thank the great panel of witnesses we have today. I would like to extend a special thank you to Senator Tom Harkin for taking time out of his extremely busy schedule to attend. His role as Chairman of the Senate Agriculture Committee makes the Senator an ideal witness to come testify on this issue. Senator Harkin was chiefly responsible for including an Energy title in the 2002 Farm Bill, and has been at the forefront of the bioenergy boom throughout his long career in the Senate.

Today, this subcommittee will have the opportunity to explore the potential for sustaining the renewable fuels sector in rural America. Members will hear from expert witnesses on issues associated with industry growth and expansion, as well as the need for future investment in human capital to address to worker shortages.

Growth in the renewable fuels industry has been a significant stimulus for the U.S. economy, particularly for small firms. More than 75 percent of all renewable fuels producers are small businesses. On average, these plants employ fewer than 50 people. These small businesses have been revitalizing stagnant local economies in rural America.

In Iowa, the exploding renewable energy sector is creating thousands of jobs. As of early 2005, it was projected that ethanol could create over 5,000 direct and indirect jobs in my state and pay $82.4 million in wages per year. To meet future demands of this expanding industry, however, it will be necessary to train thousands of new workers in the next 6 to 12 months.

The increasing number of job opportunities has caused concerns about access to a trained workforce. As the demand for a highly-skilled workforce to operate this industry emerges, plant managers are facing a need for skilled workers to run the high-tech bioenergy facilities that are sprouting across this country.

The human capital needs that these plants will face as more production facilities come on-line present a serious challenge to the biofuels industry. The job skills needed to work in the bioenergy plants of today are much more sophisticated that the manual labor required at the grain elevators I worked at in Iowa growing up in the 1970s. Today's workers need computer training and lab skills to handle the increasingly complex tasks of processing large quantities of feedstocks into energy that fuels our nation. In the ethanol sector alone, extensive and costly on-the-job training is often required.

Some states and local communities have begun to address this problem by creating training and mentoring programs at community colleges. I believe Congress must also take action to address this issue.

We need to recognize this growing demand for skilled workers and technicians to meet the expected needs of the agriculture-based bioenergy sector—particularly for small businesses. That's why I have introduced legislation, H.R. 872, *the National Endowment for Workforce Education in Renewables and Agriculture Act* (NEW ERA Act).

The NEW ERA Act would enhance the training of instructors at educational facilities, like community colleges, in the areas of agriculture-based bioenergy research, technology, efficiency, and conservation. We need to act now to meet this growing demand to capitalize on a unique opportunity to transform our energy economy and improve our international security by switching our energy focus from the Middle East to the Midwest.

There is a promising future for the next generation of bioenergy, including great potential for growth in the evolving cellulosic industry. Exciting potential in the bioenergy industry exists in every Congressional District in the country. We need to provide opportunities for the skilled workforce that will be needed to take us to the next level of energy freedom.

Despite all of the successes in the bioenergy business, we still have a long way to go. Though renewable fuels have grown exponentially over the past decade, they still make up less than 1 percent of current U.S. production. At a time when this country is facing record energy prices, it is critical that we continue to develop alternative energy supplies. Small businesses can help us achieve this goal, but only if they have the skilled employees needed to make it happen.

If we truly care about the security of our children and our children's children, we need to continue to push the envelope on the bioenergy economy. I'm excited to hear from our distinguished panel of witnesses, and I look forward to today's discussion.

I now yield to my colleague and friend from Tennessee, Ranking Member Davis, for his opening statement.

Opening Statement
Ranking Member David Davis
"Meeting the Workforce Demands of Small Bio-Energy Businesses"

House Small Business Committee, Subcommittee on Contracting and Technology
June 20, 2007

Good morning. Thank you all for being here and a special recognition to our witnesses, many of whom have traveled great distances to be with us today. I'd like to especially thank Dr. Kelly Tiller who made the journey all the way up from East Tennessee. It's great to see you and thank you again for coming.

I would also like to thank Chairman Braley for calling this timely hearing. Renewable energy provides a great opportunity for U.S. agriculture and for rural America to be leaders in this new era of energy production. And just like most emerging industries, it will be the small businesses that lead the way.

All of us recognize the strategic imperative of reducing our dependence on imported oil. We import nearly two-thirds of the oil we consume. With gas prices at or above the three-dollar per gallon range, it is very important to discuss ways to increase our energy output to keep up with demand.

We also recognize the immense potential of renewable energy for spurring growth, jobs, and wealth creation in rural America. There can be little doubt that increased demand of renewable fuels has had a positive impact on our nation's economy, including small business. Diversifying and improving our nation's energy production and consumption increases competition, which we all know drives prices down, spurs innovation, and creates opportunities for niche industries to crop up and begin to thrive. We need to promote expansion of new plants and aid research in improving this new industry's technology.

Our scientists, farmers, and entrepreneurs will continue to lead the world in developing and investing in cutting-edge technology, infrastructure, and farming methods. Advances in many fields will play an important role, such as continued improvement in crop yields, optimization of crop material as fuel feedstock, and cost reduction in the production of ethanol and other alternative fuels.

With any emerging industry, there will be a period of growing pains, including the topic of this hearing—the need for additional qualified and trained technicians to build, operate, and maintain these new plants. This phenomenon is not new. When an industry grows as quickly as this one has, there are going to be problems finding qualified employees.

In this instance, I am reminded of the famous quote from the movie *Field of Dreams*: "If you build it, they will come." I believe that as the bio-energy industry grows and becomes more prevalent, potential workers will recognize that there is an inherent value in learning a trade specific to bio-energy production. High paying, secure jobs are their own best advertisement. Hard working Americans will take the positive steps necessary to fill these jobs of the future. In helping this industry grow and prosper, we must ensure that federal dollars are put to the best use. Artificially subsidizing the growth of this or any specific workforce could cause potential problems in the future.

That said, I do believe the federal government can and will have an impact in helping our emerging bio-energy firms grow. We have asked our expert panel of witnesses to identify some of the stumbling blocks to finding, hiring, and training these new employees. Meetings like this today bring people together to discuss the challenges and opportunity for renewable energy that will pave the way for producers and consumers in the future. I look forward to hearing their testimony and working with each of you to find solutions that best fit the American bio-energy industry.

Again, I want to thank Chairman Braley for calling this hearing, and I yield back.

EDWARDSVILLE

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Committee on Small Business,
Subcommittee on Contracting and Technology
United States House of Representatives

Hearing on
"Meeting the Workforce Demands of Small Bio-energy Businesses"

Testimony of:
John Caupert
Director
National Corn-to-Ethanol Research Center
(NCERC)

June 20, 2007

Good morning, Chairman Braley and Members of the Subcommittee. My name is John Caupert and I am Director of the National Corn-to-Ethanol Research Center (NCERC) located in University Park of Southern Illinois University Edwardsville.

This hearing is crucial in its importance of assuring that a qualified and trained workforce will be ready and able to fill the thousands of jobs being created by the growth of the biofuels industry. I am pleased to be here to discuss how we as an industry and as a nation will be "Meeting the Workforce Demands of Small Bio-energy Businesses".

Background:
In 1997 the United States produced 1.3 billion gallons of ethanol (1). In a study conducted that same year by Northwestern University's Kellogg School of Management entitled, "The Economic Impact of the Demand for Ethanol", it was determined that approximately 370 jobs are created during the ethanol plant construction phase. The study also found that operation of the ethanol plant would create up to 4000 local jobs (2).

In 2002 AUS Consultants and SJH & Company conducted a study titled, "Ethanol and the Local Community". Their study concluded that nearly 700 permanent jobs are created in the area near an ethanol plant (3). In 2002 the United States produced 2.12 billion gallons of ethanol (4).

In August of 2005 President Bush signed into law the Energy Policy Act of 2005 (EPAct05). By this time the United States was producing 3.9 billion gallons of ethanol (5). EPAct 05 directly contributed to the creation of thousands of jobs across all sectors of the U.S. economy. According to John Urbanchuk, Director, LECG LLC greater than 150,000 jobs were created as a result of EPAct 05, including more than 19,000 jobs in America's manufacturing sector (6).

In a study prepared for the Renewable Fuels Association reviewing the Annual Economic Impact of an ethanol plant, Mr. Urbanchuk determined the following employment and job creation opportunities:

- A 50 million gallon per year Dry-Grind ethanol plant will create employment (jobs) 836
- A 100 million gallon per year Dry-Grind ethanol plant will create employment (jobs) 1,573

In that same study, Mr. Urbanchuk predicted that by the year 2015 more than 203,000 jobs will have been created across all sectors of the U.S. economy due to the growth of the ethanol industry (7). With the rapid growth of the biofuels industry and expansion of the current ethanol industry, it is likely the industry will achieve those employment numbers prior to year 2015.

On June 7, 2007 Bob Dinneen, President and CEO of the Renewable Fuels Association (RFA), testified before the Energy & Commerce Committee, Subcommittee on Energy and Air Quality of the United States House of Representatives. Mr. Dinneen testified that according to analysis completed for RFA, approximately 5 billion gallons of ethanol produced in 2006 had created more than 163,000 jobs in all sectors of the economy (8).

Where are the jobs?

Today there are more than 110 ethanol plants in operation and nearly 80 more under construction or expansion. While the majority of these biorefineries are built in the traditional "Corn Belt" states, the biofuels industry is seeing expansion outside of the "Corn Belt". This is demonstrated by recognizing those plants being built in places like: Arizona, New York, Oregon and Texas just to name a few.

As mentioned in the previous section of this testimony, biorefineries create permanent jobs for the local community in which the plant is constructed. Below are noted highlights from across the nation:

- South Dakota's ethanol production of 420 million gallons in 2004 accounted for over 2,900 jobs (source: "The Economic Impact of Ethanol Plants in South Dakota." Randall M. Stuefen, Stuefen Research, LLC, December 2005).

- "It's clear that new jobs are coming to Washburn. Next to the power plant north of town, a colossus of pipes and towering grain bins is rising from the prairie: an ethanol plant scheduled to begin turning corn into fuel in January. That has brought more than 400 construction and 40 permanent jobs." (source: The Wall Street Journal, December 1, 2006 by Bryan Gruley, "Energy Boom Lifts Small-Town Hope on Northern Plains; Ethanol Plant Lures Outsiders to Tiny Washburn, N.D.; Population Skid on Hold; Remembrance of Busts Pasts").

- In Indiana a combination of ethanol plants and biodiesel plants will employ more than 800 full time people if the 17 proposed biorefineries are constructed (source: Research and Analysis Department. Indiana Department of Workforce Development. Incontext, Indiana's Workforce and Economy, March 2007).

- A study conducted for the Iowa Renewable Fuels Association reports that Iowa's ethanol industry has created nearly 47,000 jobs (source: "Contribution of the Biofuels Industry to the Economy of Iowa." Prepared for the Iowa Renewable Fuels Association, John Urbanchuk).

On Saturday June 16, 2007 a search on www.ethanol-jobs.com discovered current job openings that range from Goshen, CA to Shelby, NY and from Hereford, TX to Aurora, SD. As can be seen, jobs are being created across the entire nation and the opportunities for employment are endless. These jobs encompass both the ethanol industry as well as the growing biodiesel industry. According to the National Biodiesel Board, "the biodiesel industry is expected to add 40,000 jobs to the U.S. economy" (9).

Justification of Workforce Education:
As has been demonstrated, thousands of job opportunities are available across the biofuels industry, although, the majority of biorefineries are individual plants that have fewer than 60 employees per plant and are generally considered to be small businesses. These plants do not have the infrastructure that is required to support thorough in-house training programs. Larger more established industries such as petroleum, food processing and auto manufacturing tend to have documented in-house training programs.

Designers of fuel ethanol plants offer condensed training programs for employees of newly constructed facilities, but in general training does not extend beyond start-up guarantees. In order for the biofuels industry to continue expanding at its current and projected rate, a comprehensive workforce education and training program needs to be developed and implemented.

A comprehensive workforce education and training program in the biofuels industry is necessary to:

- Increase efficiency and productivity
- Develop a highly technical workforce
- Facilitate more rapid innovation and development in renewable fuels
- Improve workplace safety
- Increase employee moral and reduce workforce turnover
- Increase environmental awareness
- Minimize natural resource usage
- Increase standard of living and improve job opportunities in rural communities
- Shift balance of trade into a more favorable direction
- Reduce our dependence on foreign oil

Gulf Coast Process Technology Alliance (GCPTA) noted the following benefits of hiring experienced interns from training programs:

- Decreased employee selection cost by 80 – 90%
- Reduced two-year new employee turnover by 50%
- Decreased job-training costs by 40%
- Decreased safety-related incidents by 37%
- An average of $16,000 in savings for every new hire

Workforce Education and Workforce Development Programs of the NCERC:
The NCERC resides in University Park of Southern Illinois University Edwardsville. Edwardsville Illinois is located in the St. Louis Metropolitan area and is less than a 20 minute drive from downtown St. Louis. The NCERC is unique in that it is the only facility in the world to house the following all under one roof:

- Analytical Laboratory
- Fermentation Research Laboratory
- Pilot Scale Dry-Grind and Wet Mill ethanol plant
- Workforce Development Training Program

Due to the number of job opportunities available in the biofuels industry and the need for workforce education outlined in the previous section of this testimony, the National Corn-to-Ethanol Research Center (NCERC) launched a Workforce Development Training Program in January of 2007. The foundation of Workforce Education and Workforce Development Training Programs of the NCERC are based on the ethanol process as seen in **Exhibit One.**

The NCERC training program titled, "Fundamentals of Applied Ethanol Process Operations" will assist in filling a void that currently exists in today's biofuels industry, the void of qualified applicants. This program ensures that employees of the biofuels industry will not only be technology analysts, but more important, they will be analyzers of analytical technology. The program developed by NCERC is unique in the fact that NCERC is the only facility in the world where a person can receive:

- Classroom instruction on biofuels
- Computer simulation training of the biofuels production process
- Hands-on applied learning in a pilot scale dry-grind and wet mill ethanol plant

There are two distinct training programs that exist at the NCERC:

1. Five day 50 hour ethanol process overview and operator program
2. One year Internship program with a second year option

The Five day 50 hour ethanol process overview and operator program is designed to provide a person with the basic, yet fundamental, terminology and understanding of the biofuels industry. A detailed description of this program can be seen in **Attachment One**. Persons that enter the Five day program have education levels ranging from a GED to a PhD. The common denominator amongst this diversified group of persons is they desire an understanding of the biofuels industry and the ethanol process.

The One year Internship program developed by the NCERC is designed for those persons who have: Training at a Vocation School, Certification or Associates degree from Community College, Bachelor's degree or higher from a four year University. Interns accepted into the NCERC program qualify at one of three levels: Entry, Intermediate, and Senior. The criteria for acceptance as an NCERC Intern are defined in **Attachment Two**. The NCERC Internship is a compensated position and offers the Intern an optional second year program.

The training programs offered by the NCERC were created from a DACUM analysis. DACUM is the acronym for "Developing a Curriculum". The DACUM utilized by the NCERC is titled, "Analysis for an Ethanol Process Operator". To develop the DACUM analysis the NCERC consulted with academia, industry, government and trade associations. The relationships born from these consultations have grown into collaborations.

To measure the success of its training programs, the NCERC created evaluation forms which are completed by an individual at the conclusion of their selected training program. Examples of NCERC evaluation forms can be seen in **Attachment Three** and **Four** and comments from a recent Intern can be read in **Attachment Five.**

Support of NEW ERA Act of 2007 (HR 872):

The National Endowment for Workforce Education in Renewables and Agriculture Act (NEW ERA) helps to address the number one issue on the mind of biofuel plant managers across this country, "where are the qualified applicants going to come from". The NCERC supports NEW ERA as it recognizes the opportunity at hand. The opportunity would be additional collaborative efforts between Community Colleges, Four Year Institutions and the National Corn-to-Ethanol Research Center (NCERC).

Collaborative success can and will be measured by assuring a qualified pool of applicants will be ready, willing and able to fill the thousands of jobs being created across the U.S. economy by the biofuels industry.

The NCERC would like to remind this panel that the biofuels industry is not limited by state borders. The NCERC encourages this panel to make NEW ERA a National program that allows for participation by Trade Schools, Vocational Training Centers, Community Colleges and Four Year Institutions regardless of Zip Code.

Conclusion:
By working together we will address the need for qualified applicants in the biofuels industry and by generating qualified applicants we will create energy independence for the United States of America. The National Corn-to-Ethanol Research Center (NCERC) looks forward to working with the 110th Congress and this Subcommittee.

Thank you.

NOTE: See Exhibit 1 and Attachments 1-5

References and Sources

1. U.S. Energy Information Administration
2. Northwestern University Kellogg School of Management
3. AUS Consultants and SJH & Company
4. U.S. Energy Information Administration
5. U.S. Energy Information Administration
6. John Urbanchuk, Director LECG, LLC
7. John Urbanchuk, Director LECG, LLC
8. Contribution of the Ethanol Industry to the Economy of the United States, Dr. John Urbanchuk, Director LECG, LLC, December 2006
9. National Biodiesel Board
10. Renewable Fuels Association (RFA)

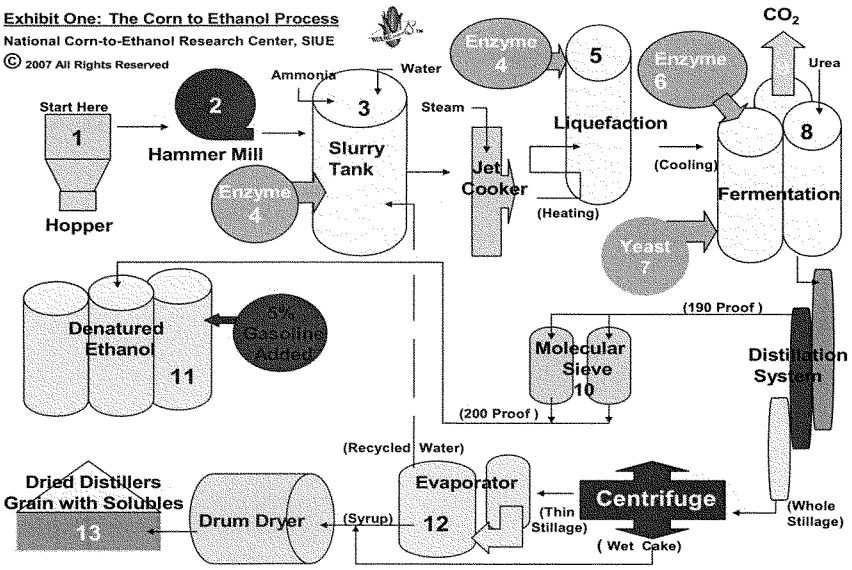


Exhibit One: The Corn to Ethanol Process
National Corn-to-Ethanol Research Center, SIUE
© 2007 All Rights Reserved
Start Here
1
Hopper
2
Hammer Mill
Ammonia
Water
3
Slurry Tank
Enzyme 4
Steam
Jet Cooker
Enzyme 4
5
Liquefaction
(Heating)
Enzyme 6
(Cooling)
CO_2
Urea
8
Fermentation
Yeast 7
(190 Proof)
Distillation System
Molecular Sieve 10
(200 Proof)
Denatured Ethanol
11
5% Gasoline Added
(Recycled Water)
Evaporator
12
(Syrup)
Drum Dryer
Dried Distillers Grain with Solubles
13
Centrifuge
(Thin Stillage)
(Wet Cake)
(Whole Stillage)

Attachment One

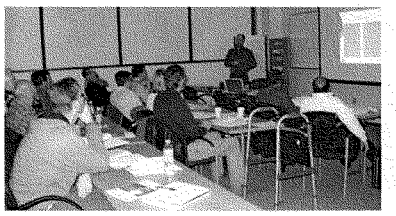
WORKFORCE DEVELOPMENT PROGRAM

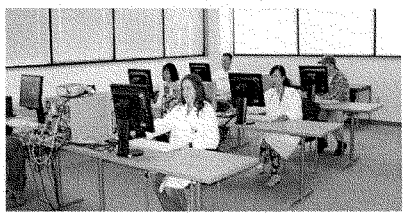
Workforce training at the National Corn-to-Ethanol Research Center provides a comprehensive overview of the skills required of a Process Operator in today's Ethanol Industry. The program is unique in that participants receive classroom training from industry leading experts, followed-up with hands-on learning in an operating ethanol plant.

The content of the program is flexible to meet the needs of the client. The Center can offer training programs that range from 1-day, multiple days, or months. Process operators and plant engineers participate in the training by explaining each part of the ethanol production process through group and one-on-one discussions.

The following topics are covered in our template 5-day training program, including classroom (30 hours) and plant (20 hours) experience:

- Overview of the Corn-to-Ethanol process
- Safety
- DACUM (skills and tasks of an ethanol process operator)
- Grain Quality
- Cooking, liquefaction, enzymes
- Fermentation and yeast propagation
- Distillation, molecular sieves
- Quality control/lab tests
- Process Operations
- Process Controls
- Co-product production (centrifugation, evaporation, drying)
- Maintenance
- Plant Sanitation
- Wastewater
- Biomethanators
- Future trends in biofuels





Attachment Two

Internship Program

Internships of various durations for a maximum of two years to provide undergraduates, recent graduates or individuals requiring retraining with hands-on laboratory or pilot plant bioprocessing experience. NCERC Internships will be staff positions under the Work Program Participant designation.

Job Description for Pilot Plant Work Program Participant:
This position will require hands on operation of a bioprocessing pilot plant in a research facility. There will be a focus on plant safety through safe operations and behavior. Responsibilities include:

- Day to day research plant operations and production; including process control systems. Developing an intimate knowledge of unit operations; their capabilities, limitations and the ability to troubleshoot and solve problems as they arise.
- The ability to assist in the development of and then follow strict research protocols and standard operating procedures for plant bioprocessing with an understanding of the research concepts and the actions required to deliver on the research concept objectives.
- The ability to identify, contact and interface with outside professionals to assist in problem solving.
- The ability to interface with clients and to provide exemplary client service.
- The ability to operate as a part of a team with shared responsibilities and commitments

Criteria for Entry Level Intern:
Student in Engineering or Science curricula preferred, in progress or complete. A mechanical aptitude/experience and experience in research project design, implementation and completion are preferred. This position will require willingness to pitch in as a part of a team and work under aggressive timelines with an attention to scientific detail. Flexibility and accountability are essential.

Criteria for Intermediate Level Intern:
The intern must show a high level of competency and responsibility and must meet certain specific criteria related to plant operations. Supervise an operating shift. Responsible for maintaining equipment, process, data collection and data interpretation during shift. Responsible for supervising plant personnel during shift. Responsible for being able to discuss research concepts and results with clients.

Criteria for Senior Level Intern:
The intern will be expected to complete long term projects. Supervise an operating shift. Responsible for maintaining equipment and process during shift. Responsible for supervising plant personnel during shift. Responsible for completing specified long-term projects. Responsible for being able to discuss research concepts and results with clients. Responsible for being able to design, oversee, and analyze research project results. Present project results to technical audiences. Determine plant approaches and modifications required to complete client projects.

Attachment Three

Evaluation for Ethanol Process Operator Training

Please describe your reason for attending (e.g., pipe fitter looking to understand .or want to change your career from

_____ to

_____.

On a scale of 1 to 5 (Circle: 1 worst to 5 best), please rate the following items. If you really liked something (5) or really disliked something (1), please let us know why.

1. Classroom environment (comfort, size, space): 1 2 3 4 5

2. Hotel accommodations. 1 2 3 4 5

3. Food at the Center (lunch, snacks): 1 2 3 4 5

4. Instructors (knowledge, congenial, approachability): 1 2 3 4 5

5. What is your opinion of the textbook Ethanol Process Fundamentals: An Introduction to Ethanol Processing (the spiral book provided in your materials)?

   _____

   _____

6. The following topics were presented. Were there any that you thought were especially beneficial or not necessary? Please comment.

   Day 1, Overview/Safety/DACUM/Grain Quality: 1 2 3 4 5

   Day 2, Cooking/Liquefaction/Enzymes/Biodiesel: 1 2 3 4 5

   Day 3, Yeast Propagation/Fermentation/Distillation: 1 2 3 4 5

   Day 4, Lab Quality Control/Process Operations/Process Control: 1 2 3 4 5

   Day 5, Co-product production/CIP/Utilities: 1 2 3 4 5

6. What was the best part of the training?

   _____

7. Are there any topics you believe should be added or deleted in the training?

   _____

8. Was the training time too long/too short? If either, please let us know details

   _____

9. What can you suggest to make the training better?

   _____

Attachment Four

SUMMARY: Pre-Test/Post-Test for the Corn-to-ethanol Production Process

Select the single best answer by placing a circle around the correct corresponding letter or placing correct response on line provided.

1. Select the correct listing of **steps in order** as they occur in a corn-to-ethanol process

a) - 1) distillation 2) beer well 3) DDGS drying 4) jet cooker 5) alpha-amylase 6) yeast
b) - 1) beer well 2) DDGS drying 3) jet cooker 4) alpha-amylase 5) yeast 6) distillation
c) - 1) DDGS drying 2) jet cooker 3) alpha-amylase 4) yeast 5) distillation 6) beer well
d) - 1) alpha-amylase 2) jet cooker 3) yeast 4) beer well 5) distillation 6) DDGS drying
e) - 1) DDGS drying 2) jet cooker 3) alpha-amylase 4) yeast 5) distillation 6) beer well

2. During **saccharification**, which is happening?

a) - ethanol is being removed
b) - glucose is being converted to ethanol
c) - starch is being broken down to sugar
d) - water is being removed from alcohol
e) - all of the above are occurring simultaneously

3. The purpose of the molecular sieve is to:

a) – remove carbon dioxide from ethanol stream
b) – helps to break down long starch molecules
c) – removes water from DDGS product
d) – remove water from final ethanol product
e) – helps to prevent bacterial infections

4. If the distillation unit is operated at 6 psig, the pressure expressed would be _____ psia

5. True or False: (*place T or F on the provided line)*

_____ a) Fermentation occurs for about 72 hours
_____ b) pH during fermentation is about 6.5
_____ c) The S in the abbreviation DDGS stands for Solids
_____ d) Alpha-amylase works in best in a pH of 12
_____ e) Any corn will work to make ethanol

1. A bushel of corn weighs 56 pounds and a typical ethanol plant process will produce approximately:

_____ gallons of ethanol, _____ pounds of carbon dioxide and_____ pounds of DDGS

7. The **jet cooker** serves two completely different functions:

1) _____
2) _____

8. Only one third of the alpha-amylase is added to the slurry tank and the other two thirds is added in the liquefaction tank. Why isn't the entire alpha-amylase enzyme added at once in this process?

_____

9. Adjustable motor speed drives control the motor speed by changing:

a) Voltage
b) Current
c) Frequency
d) Phase
e) all of the above

10. A magnetic flow meter measures which of the following flow rate

a) Volume
b) Mass
c) Fluid Conductivity
d) Fluid Density
e) Temperature

11. A D/P transmitter can measure

a) Flow
b) Pressure
c) Level
d) Temperature
e) All the above

12. Identify the following letter abbreviations in process control terms:

PV _____ _____
SP _____ _____

Attachment Five

Exit Interview with Intern Billy Whitlock

1. **What did you expect to learn/experience when you first started at the NCERC?**
   I remember thinking that I would develop hands on skills, such as plant maintenance, equipment set up, and how to work with various tools. I also knew that I would learn the dry grind process and how to operate the pilot plant.

2. **If you had it to do over again, would you, why/why not?**
   Yes. It's hard for me to imagine getting the type of experience I gained at the NCERC, in a single year, anywhere else. The year of internship gave me time to grow out of being an inexperienced and directionless college student. Not only did I learn about ethanol production, chemical plants in general, and laboratory methods, but I began to understand what different people are doing at different companies out in the working world by seeing what different sets of people do at NCERC. This insight allowed me to understand what type of job I would most like to have. The technical competency I gained at the NCERC helped me to get that job.

3, **Did location influence your choice?**
   Yes, the fact that the NCERC is on a college campus and close to St. Louis made the idea of moving seem more attractive (before the fact). In the end, being able to use the SIUE fitness center was one of the benefits of being affiliated with the university. I did meet a small amount of SIUE students outside of work.

4. **Provide a list or narrative describing what you learned here that you did not learn in school.**
   Coming out of school (out of a very reputable school at that!), I had never been in a chemical plant. I had no idea what a pump looked like. I didn't have a good understanding of what it meant to get air in a pump or dead head it. In school, we attempted to design plants and processes. In these designs, material would move from tank to tank by simply drawing a line between them. The flow rate of this material was controlled by the number you wrote on the stream table at the bottom of the page. Are you seeing my point here?

   Actually seeing how our pilot plant was assembled and then operated was the most obvious thing I learned here and not in school. Also, I believe that to an extent the different jobs that needed to be done at the NCERC represent the different divisions of labor in other plants. I saw first hand what maintenance, operations, engineers, hired contractors, plant managers, and lab staff would do. As an intern, you get a chance to participate in almost all of these divisions of labor. I believe an internship at the NCERC prepares you to apply the abstract science learned in school in a real plant, lab, or company. The experience with working together with different people and different divisions of labor should not be overlooked.

5. How do you think this experience will (or has) help(ed) you in finding a first job and/or the type of job(s) you are qualified for vs. if you had applied for a job right out of school.

I think it would be very difficult to find an ethanol job right out of school, unless you had concentrated in bioprocessing or biochem. Most of the jobs available to Chemical engineers right out of school are from large companies that have the money to train up engineers (Proctor and Gamble, Shell, etc). While these are good jobs, a new employee may not get to choose the field they would like to work in. An internship at the NCERC provides an opportunity to see many of the different jobs required in the chemical industry. After a year, an intern should have a much better idea of what roll they would like to play (or not play) in an industrial setting.

The internship program is a perfect way to develop the experience needed to get started in the ethanol industry. While many of the skills developed in the NCERC program are universally important, I believe that the NCERC experience provides the most benefit to those who are interested in biofuels, the starch industry, or perhaps the alcoholic beverage industry.

6. How do you recommend the program be changed?

One of the toughest parts of working at the NCERC was the systematic overtime. I believe that these tough times helped to teach determination and made more responsible workers out of us. Overtime was most discouraging to me early on, before I developed a sense of my importance to the facility. The NCERC helps to warrant an attitude of "I will work as much as it takes to get the job done". Many of us were willing to bend to get the job done and I'm sure many interns to come will be willing to do the same.

7. What would you NOT change about the program?

The interns should always be asked to serve as operators working on shift work. The interns should still be required to participate in maintenance, lab work, and office work. I think it is important that interns be allowed to experience as many of the different divisions of labor at the NCERC as possible. Interns would not learn as much if they were asked only to operate, or only to do DEs and HPLCs. Secondary responsibilities, such as building an enzyme cart, helping to recruit interns, or testing methods in the laboratory provide interns with different experiences and make the job more challenging. I would definitely keep the monthly training programs, and continue take interns to tour other full-scale ethanol plant.

8. Were the monthly training programs of use and if you could improve, please make your suggestions.

I thought that the monthly training sessions were awesome. Understanding the concepts discussed in those training programs is what separates the people that build, manage, and improve plants from the people who simply operate. The information I learned from those training programs, from the ethanol handbook, from private reading, and from a personal interest in the lab went the farthest towards helping me get a job. Paying attention to the training program about carbohydrate chemistry and enzymes may have made the difference in me getting my current job at Novozymes.

9. OPEN--any other items you think will improve the program, please feel free to list them here.

An internship at the NCERC is an amazing opportunity if you're interested in learning about how a chemical plant runs in general and ethanol production. In my opinion chemical engineers probably have the most to gain from a plant internship. This being said, the NCERC has more to gain by hiring a wide variety of interns with different skill sets. Someone interested in biofuels, the wellbeing of the environment, brewing, and chemical or process engineering will love the NCERC Internship program.

U.S. House of Representatives Committee on Small Business

Subcommittee on Contracting and Technology

"Meeting the Workforce Demands of Small Bio-Energy Businesses"

June 20, 2007

Testimony of Ron Litterer, First Vice President

National Corn Growers Association

Mr. Chairman, Ranking Member Davis and members of the Committee, on behalf of the National Corn Growers Association (NCGA), I appreciate this opportunity to discuss the renewable fuels industry and the growing need for a trained workforce in the field of bioenergy.

My name is Ron Litterer and I am a corn farmer from Greene, Iowa. I am First Vice-President of the National Corn Growers Association. The National Corn Growers Association represents more than 32,000 corn farmers from 48 states. NCGA also represents more than 300,000 farmers who contribute to corn check off programs and 27 affiliated state corn organizations across our country, working together to create new opportunities and markets for corn growers.

The National Corn Growers Association applauds your efforts, Mr. Chairman and this Committee, for recognizing and addressing the critical need for a strong, trained workforce for the bioenergy industry. Today, there are 121 ethanol plants online with 75 plants under construction with each plant creating around forty new jobs in rural America. In my home state of Iowa there are 28 ethanol plants with more than 1.7 billion gallons of annual capacity; these plants have created more than 27,200 jobs across Iowa, stimulating the local economies and invigorating rural development across the state.

As you may know, the ethanol industry is one of the most significant success stories in American manufacturing over the past quarter-century. From a cottage industry that produced 175 million gallons in 1980, the American ethanol industry has grown to include 121 manufacturing facilities with an annual capacity of nearly 6.2 billion gallons. Today, renewable fuels have become a critical part of U.S. energy policy. As a consequence of continued high petroleum prices, regional instabilities, and America's commitment to reduce our dependence on foreign oil, ethanol and other renewable energies are now a critical component in our efforts to build a strong, domestic energy supply.

These developments in the biofuels industry have spurred new value-added agriculture businesses, employment opportunities, and ethanol plant investments throughout the country. In the Midwest, corn ethanol has made significant contributions to rural communities and has created thousands of jobs in much needed areas. As corn ethanol continues to grow and cellulosic ethanol begins to develop, we must have a dedicated and trained workforce to operate these facilities in all regions of the U.S.

According to a study by John Urbanchuk on the economic contributions of the ethanol industry, in 2006 alone, the U.S. saw the creation of 163,034 jobs in all sectors of the economy due to the increase in gross outputs resulting from ongoing production and construction of new ethanol capacity. These include more than 20,000 jobs in America's manufacturing sector—American jobs making ethanol from grain produced by American farmers.

Again, a key component to the success of the U.S. ethanol industry over the next decade will be to ensure the industry has a ready and available workforce. Community colleges, land-grant universities and technology education centers are well-positioned to train and educate a robust and productive workforce. These institutions will play a unique role in serving both the educational needs as well as meeting the growing needs of the booming bioenergy sector. By making

available a dedicated grant program to these institutions, the critical hands-on training required to operate these facilities will be available to all persons interested in pursuing a career in bioenergy and will provide countless new opportunities for American workers. The collaborative efforts of industry, educational institutions, along with government investment will grow the bioenergy field and create good jobs and clean energy.

The National Corn Growers Association believes legislation like the National Endowment for Workforce Education in Renewables and Agriculture Act, the NEW ERA Act, would help to expand our nation's capacity to identify and track the new jobs and skills associated with the growing renewable energy sector as well as develop and support national and state skill training programs that will demonstrate best practices in addressing skill shortages that have already begun to effect the expansion of renewable energy facilities.

Already, the renewable and energy efficiency industries are feeling the pinch of labor shortages. A 2006 study from the National Renewable Energy Lab (NREL) identified the shortage of skills and training as a leading non-technical barrier to renewable energy and energy efficiency growth. The NREL study identified a number of critical unmet training needs, including lack of reliable installation, maintenance, and inspection services, the shortage of key technical and manufacturing skills, and failure of the educational system to provide adequate training in new technologies.

While the renewable energy industry uses many skills that can be transferred from other sectors, in many other cases, ethanol and bioenergy plants require specific, new skills to take maximum advantage of the newer energy technologies. By establishing this grant program specifically geared toward the renewable energy and agriculture sectors, this legislation would enable the United States to build the workforce the ethanol and renewable energy industries need to achieve their maximum potential.

The National Corn Growers Association believes strongly in the continued commitment of this country to build a strong, domestic renewable energy industry and workforce. Ethanol and other bioenergy technologies will play a significant role in reducing our dependence on foreign oil, building up hundreds of rural economies, and creating thousands of new job opportunities across this country. The renewable fuels industry has proven to be one of the greatest success stories of rural development in this country; bringing with it opportunity and prosperity for the American farmer.

Mr. Chairman, members of the Committee, I would like to thank you again for the opportunity to be here today to discuss this important issue.

Thank you.

House Committee on Small Business
Subcommittee on Contracting & Technology
Meeting the Workforce Demands of Small Bio-energy Businesses
Wednesday, June 20, 2007 at 10:00 a.m.
Room 2360, Rayburn House Office Building

Testimony by

Bruce Rastetter

Good morning, Mr. Chairman and Members of the Committee. It is a pleasure to be with you this morning to discuss workforce training for the biofuels industry. This education and training is vital to the long-term, sustained growth of the industry. I greatly appreciate your willingness to hear my perspective on these issues as the CEO of an ethanol company.

I am the Founder and CEO of an ethanol company called Hawkeye Renewables. Hawkeye is headquartered in Ames, Iowa. We currently have operational plants in Iowa Falls, Iowa and Fairbank, Iowa. Additionally, we are currently building two more plants that will double our overall capacity. Those plants are located in Menlo, Iowa and Shell Rock, Iowa.

Hawkeye is currently the fourth largest ethanol producer in the United States, annually producing 230 million gallons of ethanol. At each of our plants, we will employ an average of 45 people. Our plants are currently located in rural areas, and our company is keenly focused on recruiting well-skilled workers to fill the staff rosters at our plants.

As an operator, I can tell you there is absolutely no lack of demand or interest for jobs in the biofuels industry. When our Fairbank plant was set to open, we received over 800 applications for 45 jobs. However, I can tell you that it was easy to sift through prospective hires based on the degree of education, training or experience that applicants had.

In fact, of the 45 people per plant, on average we only receive applications from 7-10 people per plant that have any degree of experience with biofuels. For the remaining employees, Hawkeye, like so many other ethanol producers have implemented wide-ranging, comprehensive training programs for each plant. At Hawkeye, we partnered with our technology partner, ICM, to implement a training and education program for all plant employees.

Moving forward, this is an exciting industry to be a part of. Frankly, being located in America's heartland in Iowa, there is a great degree of hope and excitement about the quality of the jobs offered, as well as the overall effect of contributing to our national economy and national energy security.

As with any growing industry, the biofuels industry faces a number of issues related to its continued and sustained growth. One of the most important challenges is access to a quality

workforce that is educated and trained for work in the biofuels space. That's why I am very pleased to be with you today to discuss Congressman Braley's initiative to help bolster training and education at our community colleges in Iowa and across America.

Building Relationships with Educational Institutions

Across the nation, biofuels plants have sought to build collaborative relationships with educational institutions at all levels – be it in research and development with research universities or in training and education with community colleges like we are discussing today. The relationships between those that are active and operational in the industry with those in the education community will have long-lasting positive effects.

It is worthwhile to remember that this industry is still relatively new and is undergoing massive growth. Because of that, there is still an incredible amount of work to be done in research and development with biofuels, and that research will no doubt lead to more and better jobs as well. This industry will continue to grow through the use and development of additional technologies and that will require additional education and training to ensure there is a prepared workforce for these jobs that will come online.

I am reminded of what happened with oil many years ago in Texas and that part of our country. Because of the new discoveries, new jobs, and new technologies that continued to develop, many educational institutions invested in training and education for jobs and research related to that industry. While the country has had to continue to look for oil elsewhere, people from around the world that want to learn the from the very best about the oil production and discovery space come to school here – in America.

The center of intellect and potential for renewable and alternative energy should be in America, and I would further argue that it makes sense for that to be located in the Midwest. And with encouraging pieces of legislation like this bill, we continue to move toward that potential as a reality.

A Community College that Leads

Hawkeye has a great relationship with Ellsworth Community College – our local community college in north central Iowa. We have actively sought to work with Ellsworth to help them develop an appropriate curriculum for a renewable energy educational program. And, they have moved aggressively to put together and implement a curriculum for just that. Frankly, I think that Ellsworth should serve as a model for what other community colleges around the nation can do to implement effective training and educational programs for jobs in the biofuels industry.

Ellsworth Community College, located in Iowa Falls, Iowa offers a nationally recognized agriculture program and the oldest community college biotechnology program in the country. In response to the growing fields of bio-energy and other agriculture-based, renewable energy resources, Ellsworth Community College is building the Agriculture and Renewable Energy Center. Ellsworth's agriculture and biotechnology programs will be brought under one roof at the new center to facilitate collaboration and access to shared resources as well as to increase interaction with business, industry, and the community.

The Agriculture and Renewable Energy Center will include learning studios, laboratories, conference space, and small business incubation facilities. Funds for the facility are currently being raised through a combination of a general obligation bond, grants, and private funding. Once constructed, resources will be needed for equipment, faculty professional development, and infrastructure improvements to make sure the center can met the needs of students as well as business and industry in the pivotal years ahead.

All across the Midwest, the experience that Hawkeye has had with Ellsworth is being replicated by other plants with many more community colleges. Community colleges are seizing on this opportunity to help adapt and prepare a skilled workforce for these biofuels-related jobs. Over the long term, these relationships will add incredible value to each community and worker within that community that gets trained for a job in this space.

The New Era Act

I had the pleasure of meeting with Congressman Braley a few weeks ago and talking generally about the industry as well as Hawkeye Renewables. Congressman Braley shared with me his overall vision and asked me if I would look at his bill. I was glad to – and one of the first people I called was the Provost at Ellsworth Community College Mollie Teckenburg. Mollie is a real local leader and helped spearhead Ellsworth's institution of a renewable energy educational curriculum. So, I must thank Provost Teckenburg was her help and assistance prior to my testimony today.

After my own review, and in consultation with community college leaders, I believe the New Era Act introduced by Congressman Braley will be a vital resource for providing this crucial support to Ellsworth and other community colleges around the country.

I am encouraged for the forward-thinking of Mr. Braley and other Members who realize the necessity of investing in a well-trained workforce. As my previous example indicated, there are many people with an interest in gaining employment in the biofuels industry, some just may lack the necessary skill-set to obtain employment. The return on investment grants like this can provide for communities, states and our nation is immeasurable.

While I am wholly excited about this legislation and its potential, I would just want to provide some caution to the Chairman and other members.

The first is that this industry is growing at an incredible rate. Because of that, the more attention that can be given to education and training the better. In an industry that is growing like the biofuels industry, we will likely continue to face skilled worker shortages, and programs like the one proposed here will be very helpful. That said, I hope the Congress takes the fluidity of the current environment in mind when designing this or additional legislation in the future. Because of the speed at which new research and development moves in this space, the more that the Congress can empower community colleges to adapt their programs and curriculum without undue government bureaucracy, the better. Speed and the ability to adapt will be absolutely crucial.

And second, please continue to elicit feedback from those operating in the industry like myself and those providing education and training programs to prospective workers. The value that the perspectives of operators and educators active in the space can add is of enormous value – ensuring that the dollars you spend at the federal level are spent in the most efficient way and has the most effect.

Conclusion

In conclusion, I must thank Mr. Braley for his leadership on this issue, and commend the committee for providing needed leadership on this issue. Ethanol and biofuels present a key component for our national energy security and a vital component of continuing to be able to have the industry grow is access to a quality, highly skilled workforce.

I envision a future where the ethanol plants that my company operates today are not just a stand-alone ethanol production and DDG facility. Instead, I envision each plant as a complete biotech complex that will produce a variety of products. The complex may include factionalization technology, spinning oil off of corn to produce bio-diesel, biomass production, or even cellulosic ethanol production.

The future is bright and with your help, we will be prepared with a skilled workforce to meet the demands of the large-scale change we will go through in the coming years.

Thank you all for your leadership. I look forward to your questions.

Meeting the Workforce Demands of Small Bio-energy Businesses

Subcommittee on Contracting & Technology
House Committee on Small Business
U.S. House of Representatives
Wednesday, June 10, 2007, 10 a.m. – 12 p.m.
Room 2360, Rayburn House Office Building

Testimony of:

Dr. Patricia Keir, Chancellor, Eastern Iowa Community College District
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My name is Dr. Patricia Keir, and I am the Chancellor of Eastern Iowa Community College District, a district which includes Clinton, Muscatine, and Scott Community Colleges and incorporates small urban, suburban, and primarily rural communities. Since all three of our colleges sit on the Mississippi River, our district also participates in a number of bi-state economic and workforce development initiatives with Illinois – particularly in the Quad Cities area. I am honored to be here. In my brief remarks this morning, I would like to address the role that the nation's community colleges can play in preparing the workforce for the emerging and exciting bio-fuels and agriculture based products small business sector, and how our participation could be best led and structured.

Recent political events have made us more aware of America's vulnerability and growing dependence on foreign oil, and have increased public interest in developing bio-energy and other renewable, locally available energy resources.

Robert Lane, the chairman and chief executive officer of Deere & Co., recently said, "Not only does rural America have a role to play in feeding the nation and the world, but its health is also critical to ensuring a vibrant U.S. economy in the future. The challenges faced around the globe from increased global competition in food, fiber, and fuel markets require significant strategic investments in rural America's future."

Providing liquid fuels and electric power from American farmlands is a win-win situation for rural economies, national energy security, and the environment. Rural America needs new economic development opportunities. At the same time, America faces the challenge of finding affordable, reliable, and clean energy needed for economic growth.

These bio-energy business opportunities are truly nationwide, but since I am from Iowa, my examples tend to be Iowan. According to the Iowa Renewable Fuels Association, Iowa is the nation's number one ethanol-producing state, processing more than 400 million bushels of corn into 1.1 billion gallons of ethanol annually. David Swenson, an associate scientist in economics at Iowa State University, recently estimated that about 570 to 580 new ethanol jobs may be created in Iowa for people with associate's degrees in programs such as biofuels or biotechnology in the next three years.

Swenson said about 25 to 30 plants would likely come online in Iowa in the next three years, bringing the total number to more than 50, and employing about 55 to 60 people each. Of those jobs, Swenson said, about a third would be well-suited to people with associate degrees in biotechnology. Another third, he said, would require at least a four-year degree in engineering or related fields, and another third would likely require experience — such as grain handling or truck driving — but not a particular degree. And again, these numbers represent just a piece of the projected bio-energy jobs to be filled in the state of Iowa. Similar bio-energy opportunities and therefore workforce preparation needs abound in almost every state.

How do we efficiently and effectively prepare a workforce to meet these needs? I would confidently recommend a leadership role for community colleges. There are more than 1200 community colleges distributed across the United States that educate 46% of all undergraduate students. community colleges are often the only educational institutions and thus the primary source of workforce training for many rural areas and they all share the goals of access and equity with open admission policies and low tuition. No other segment of higher education is more responsive to its local community and workforce needs.

Given the explosion of interest in bio-energy, particularly in the Midwest, we need to rapidly develop and deploy education and training programs to meet the emerging needs of the many related small businesses popping up everywhere. In general, the types of jobs key to supporting the projected growth in the ethanol industry, for example, could be evenly divided into thirds: individuals needing short-term training, associate degreed technicians, and graduates with four year and advanced degrees.

community colleges are the starting point for all of these levels of training, with their noncredit and short-term program options, their two year associate degree programs, and their mission to prepare students to transfer credits into four year colleges and universities.

Building awareness of the small business workforce opportunities in this new field is also essential. Clearly, the U.S. needs to gear up to create and prime the pipeline with up and coming agriculturally based technicians, scientists and engineers. But today's young people and re-entry adults are entering a buyer's market. There is no shortage of industries and types of small business vying for their attention and career choice. We must make career awareness of the new and emerging bio-energy field a priority in our nation's middle schools, particularly in rural areas. Research shows us that the middle school years are the best time to positively influence students and parents regarding the choice of career and the appropriate educational preparation to achieve it. Again, because community colleges, and in particular community colleges located in rural areas, are so tightly connected to their local K-12 systems and have stepped up to articulate a seamless transition for many students in high school into college level course work, we are well positioned to start to fill the pipeline to do four things: provide short term certificate training to upgrade the current workforce for these new jobs, provide – collaboratively – associate degrees and certificate programs to provide technicians for the new industries, to provide transfer students with the science, math, and engineering skill levels that will serve them well when they transfer to four year universities and to work closely with those universities to articulate the programs and motivate students to take the hard road to prepare for success in them.

There is no doubt currently that individual community colleges have already eagerly stepped up to individually develop programs to meet local needs. However, I want to make the point that a more systematic, collaborative approach would streamline the process, reducing duplication or an excess of training programs, making sure that everyone has access to the most up-to-date, thorough curriculum through collaborative systems, and acting in consort to be sure that we don't create an oversupply of technicians in certain areas and an insufficient number in others.

There is a model for optimum coordination and responsiveness to address the need for technicians, to increase the number students prepared and motivated to transfer into more advanced bio-energy fields at our universities, and to be sure that the curriculum taught is on target to meet the needs of ever-changing, expanding technical workforce fields. Through its Advanced Technology Education (ATE) program, the National Science Foundation has created an approach and a system through the nation's

community colleges to educate technicians for all of the high-technology fields critical to our nation's economic future. Bio-energy should certainly be included. The ATE program fosters partnerships between academic institutions and employers to promote improvement in the education of science and engineering technicians at the undergraduate and secondary school levels. The ATE program also supports curriculum development and dispersal of that curriculum into community colleges and the K-12 sector, provides professional development of college faculty and secondary school teachers and formal connections to universities. And, perhaps most important, the ATE Centers of Excellence, situated at a lead community colleges throughout the nation, are resources to all community colleges and the communities they serve, maximizing the reach of the work and reducing duplication of effort.

At the Eastern Iowa Community College District, for example, we host a National Science Foundation Center of Excellence in the area of Energy and the Environment. Our ATE Center serves as a resource and clearinghouse for curricula and training materials, professional development of faculty, and program improvement strategies. The results of our work are shared with other community colleges throughout the nation and through them into their K-12 and business partners. "Re-inventing of the wheel" is minimized and a community college seeking to meet local training needs can quickly turn to us as a resource to implement needed programs in their local areas.

To me, America's rural landscape is an exciting place. Our farms are emerging as a primary source of materials to address our nation's energy and sustainability challenges. Research is showing us more and more interesting uses for biomass. Small businesses are popping up everywhere in response to this ongoing transformation. However, given the intellectual challenges of this new field, and the "depopulation" of many of our rural areas, we must commit to choosing a systematic, efficient, and forward-thinking system of bringing workers into the field and training them to meet the its demands -- at every level. I believe that our agricultural sector -- long known for "feeding the nation" -- will assume the role of "fueling the nation." Small business will play a key role in making this transformation a reality. Located throughout the nation, accessible to all, closely tied to K-12 and universities, known to be responsive to local business and to move quickly to address emerging and projected workforce needs, community colleges should be regarded as a leader in the meeting the workforce demands of small bio-energy businesses.

Thank you very much for giving me this opportunity to share my thinking with you.

Quad City Times
www.qctimes.com

Career path focuses on alternative energy

By Tom Saul | Tuesday, June 12, 2007

Eastern Iowa Community College District gets $1.5M

A grant for nearly $1.5 million to the Eastern Iowa Community College District will allow it to pay for development of environmental and sustainable energy education programs for community college and high school instructors.

The grant, from the National Science Foundation, or NSF, will be paid over four years, said Ellen Kabat Lensch, the district's executive director of resource development and innovation. It will fund programs at the district's Advanced Technology Environmental and Energy Center.

Some of the programs that will be paid for with the grant include expanded professional development for teachers, expansion of a Web-based digital library, increased access to environmental and energy programs and curricula and help in paying for institutes and conferences throughout the year.

The latest grant is in addition to $459,743 received from the NSF recently that allows environmental and energy technicians to attend two, 10-day intensive annual workshops at national laboratories.

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http://bioediowa.org/grid/grid.aspx

biorenewable education in Iowa

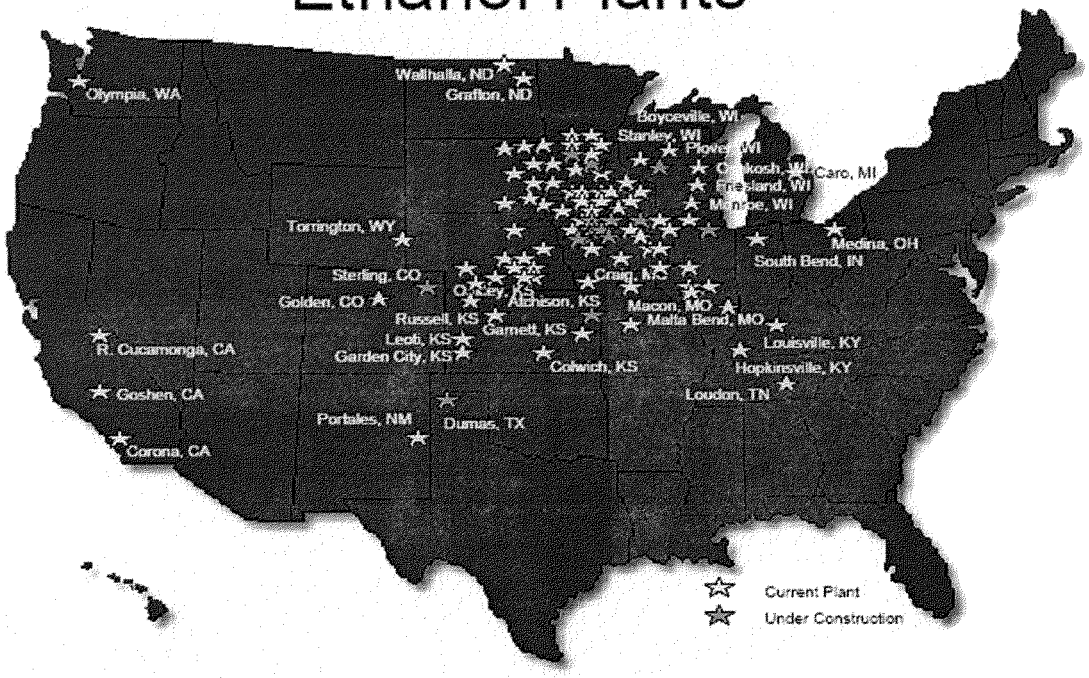
	Program Content	DMACC	EICC	HCC	ICCC	IHCC	ILCC	ISU	IVCCD	IWCC	KCC	NCC	NIACC	NICC	SCC	SWCC	UI	UNI	WITCC
Associate of Applied Science (AAS)	Biochemical											P							
	Biofuels/Biomass				C	C	C					C							
	Bioprocessing											C	C						
	Biotechnology				C										P				
	Industrial Automation/Process Control	P	C																C
	Renewable Energy																		P
Associate of Arts (AA)	Bioscience	C											C		P	P			
Associate of Science (AS)	Biofuels/Biomass								C										
	Bioprocessing	F				C													
	Bioscience					C								F					
	Biotechnology								C										

	Renewable Energy					C												
Associate of Science w/Career Options (ASCO)	K-12 Professional Development																	C
Bachelor of Arts (BA)	Biochemical																C	
	Bioscience															C	C	
	Biotechnology																C	
	Plant Sciences																C	
Bachelor of Science (BS)	Biochemical															C	C	
	Bioinformatics																C	
	Bioscience	C														C	C	
	Industrial Automation/Process Control															C		
	K-12 Student Outreach															C		
Certificate	Biochemical	C	P						C			C						
	Biofuels/Biomass	P						P										
	Bioprocessing						C					C	F			C		
	Bioscience		P													C		
	Biotechnology		P															
	Career Academies						C											
	Concurrent Enrollment (i.e. Dual Credit) Courses		P															
	Industrial Automation/Process Control		C		C													
	Lab/Instrumentation										C							
	Renewable Energy		P				C											P
Continuing Education	Biochemical	F																

	Biofuels/Biomass					C			P	P							
	Bioprocessing	F				C											
	Biotechnology	C				C											
	Industrial Automation/Process Control					C			F				C				
	K-12 Professional Development					C						C					
	Lab/Instrumentation					C			P								
	Renewable Energy						P		P				P				C
Diploma	Biofuels/Biomass								P								
	Bioprocessing												C				
	Biotechnology								C								
	Renewable Energy						C										C
Doctorate of Philosophy (PH.D.)	Biochemical														C		
	Bioprocessing														C		
	Bioscience														C		
	Industrial Automation/Process Control														C		
High School Outreach	Biofuels/Biomass						P										
	Bioscience												P	P			
	Biotechnology	C				C											
	Concurrent Enrollment (i.e. Dual Credit) Courses											C					
	K-12 Professional Development	C															
	K-12 Student Outreach											C					C
Master of Science (MS)	Biochemical														C		

	Bioprocessing															C			
	Bioscience															C			
	Industrial Automation/Process Control	C																	
Other - Please Indicate in Comments	Bioscience												F			C			
	Biotechnology	C																	
	Career Academies																		C
	Concurrent Enrollment (i.e. Dual Credit) Courses					C													
	K-12 Professional Development												C						C
	K-12 Student Outreach									F									

Ethanol Plants



http://www.iowabeefcenter.org/content/USAMapEthanolPlantsJuly05.pdf

Testimony of

Kelly J. Tiller, Ph.D.
The University of Tennessee

Before the House Small Business Committee
Subcommittee on Contracting and Technology

June 20, 2007

Chairwoman Velazquez and Members of the Committee, thank you for the opportunity to speak to you today about workforce needs and opportunities in the evolving bioeconomy. My name is Kelly Tiller, and I am an agricultural economist at the University of Tennessee. The emerging bioeconomy is poised to change the face of the nation. If we do this right, I believe we can capitalize on an economic development boon for generations to come.

The biotechnology, biofuels, and bioenergy industries have experienced unprecedented growth over the last few years. But most industry watchers suggest that the rapid growth we have seen over the last few years may eventually look like the early flat part of an exponential growth curve yet to come. Much of the biofuels growth over the mid-term to longer-term is expected to be through the commercial scale development of a vibrant and sustainable cellulosic biofuels industry, where lignocellulosic biomass material from a variety of locally appropriate sources contributes feedstock for a range of technically appropriate biorefinery processes.

A group of University of Tennessee economists recently conducted a study for the 25x'25 Work Group, providing projections of economic and ag sector impacts associated with a scenario where U.S. farms, forests, and ranches would provide 25 percent of U.S. total energy needs—along with continued production of safe, abundant and affordable food, feed, and fiber—by the year 2025[1]. The report provides projections on the impacts that would be likely to occur if such a goal is attained.

In the scenarios examined, the nation moves from today's base of providing 1.87 quads of energy from renewable biomass resources to providing an additional 15.45 quads of energy from agricultural and forestry lands by 2025. This includes production of 86 billion gallons of ethanol and 1.2 billion gallons of biodiesel from America's fields, farms, and forests. In addition to expansion of corn grain ethanol and significant use of agricultural crop residues and forestry residues for ethanol production, achieving such a large ethanol production level requires the net addition of 17.3 million acres of switchgrass as a dedicated energy crop by 2015, 56.8 million acres by 2020, and 105.8 million acres by 2025.

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[1] English, Burton C., Daniel G. De La Torre Ugarte, Kimberly L. Jensen, R. Jamey Menard, and Chad M. Hellwinckel. "25% Renewable Energy for the United States by 2025: State Level Agricultural and Economic Impact Tables." Department of Agricultural Economics, The University of Tennessee. February 2007.

Through a combination of simulation modeling using the POLYSYS model and input-output modeling using the IMPLAN model, the study estimates that by 2025, agricultural sector employment increases by more than 1.7 million jobs, with more than 3.4 million new jobs added in the renewable energy industry, and nearly 2 million jobs added through interstate commerce. In total, the economic gains in the renewable energy and agricultural sectors plus interstate commerce top $704 billion by 2025, supporting the creation of more than 5 million new jobs.

Achieving these levels of biofuels—and particularly cellulosic biofuels—capacity would truly be transformational. Other goals and policies supporting and even requiring significant expansion of cellulosic biofuels are currently being discussed as part of comprehensive energy policy and reauthorization of the Farm Bill. One such proposal includes increasing the renewable fuels standard from the current required mandate of 7.5 billion gallons by 2012 to a much higher level: up to 36 billion gallons required by 2022. It is widely recognized that such significant expansion in sustainable, renewable biofuels cannot be achieved without the successful widespread commercialization of lignocellulosic ethanol processes and technologies.

The lignocellulosic biofuels industry is in its infancy stages of development today. Currently, there are no commercial-scale cellulosic biorefineries in operation in the U.S. The only dedicated energy crops produced today are largely research and demonstration in nature, in advance of available commercial production and market opportunities. Commercial production of biomass feedstocks as well as commercial scale manufacturing of cellulosic biofuels will require significant changes in both the agricultural production sector and also the energy manufacturing sector.

Manufacturing Considerations for Cellulosic Biofuels

According to the Renewable Fuels Association, there are currently 196 ethanol plants either in operation, construction or expansion in the U.S., projected to have a total capacity of 12.5 billion gallons once they are all online[2]. If one assumes a future average biofuels plant manufacturing facility capacity of 50 million gallons per year, achieving 36 billion gallons of biofuels capacity by 2022 would require 720 operating plants spread across the U.S. Achieving the targets projected in the 25x'25 report of 86 billion gallons of ethanol by 2025 would require 1,720 plants averaging 50 million gallons per year. By either standard, significant advances in commercial scale cellulosic biofuels manufacturing are required with no time to spare.

> *Regional approaches to cellulosic biofuels will develop.* The wide regional variety in biomass feedstock material to supply bioenergy production presents both tremendous advantages and also challenges. First, we need careful assessments of regional feedstock opportunities and comparative advantages to tailor appropriate technologies and approaches. Manufacturing processes and technologies need to be tailored to feedstocks for which a region has a comparative advantage. These region specific approaches will need to be refined as the industry matures.

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[2] Estimates available at http://www.rfaethanol.org, as of June 14, 2007.

Cellulosic biofuels manufacturing is an emerging industry. Only a few people today have much experience in this infant industry, and for cellulosic ethanol, there exists effectively *no* experienced commercial workforce. While some workers have skills and experience in related fields that will transfer well to the emerging cellulosic biofuels industry, the list of needs is long: from research scientists to engineers to chemists to plant managers to construction workers to logistics planners to inspectors to service workers to truck drivers, to name a few. It is important to recognize too the significant requirement for *net* employment gains in the industry. A net influx of skilled workers is needed, beyond transfers within the energy manufacturing industry sector.

Progressive research programs are imperative. As of today, we do not have a track record of a commercially proven technology and business model for cellulosic biofuels in the U.S. We certainly expect that to change in the near future, but it emphasizes the needs for significant investments in research and demonstration to lead to a commercially viable industry base from which we can grow. We need highly trained research programs to advance technologies and processes. Obtaining and retaining intellectual property in this emerging industry will be required to aggressively move the cellulosic biofuels industry forward to commercial deployment. It is important not only that we develop new technologies and processes in the U.S., but that we retain the intellectual property without having to "import" technologies developed in the U.S. back into the country for licensing and use.

Local ownership provides additional development benefits. To the extent that farmers and other stakeholders in local communities can be actively invested and involved in the cellulosic biofuels industry development, there are opportunities for added benefits for rural and agricultural communities. Retaining economic returns in local communities promotes further investments and improvements in education, healthcare, and social services, as well as economic development.

Agricultural Production Considerations for Dedicated Energy Crops

As previously described, achieving significant long-term growth in the bioenergy industry will require widespread and significant production of new dedicated energy crops. This requires development of entirely new crop systems and models, and significant educational efforts to spread knowledge and improve production processes. Today, we have more questions than answers about producing dedicated energy crops. But we do know that the potential certainly exists for energy crops to easily rival or surpass traditional commodity crops in their positive contributions to farm income, rural economic development, and conservation.

Significant research efforts are required to develop new crops and processes. We are essentially starting from scratch to develop dedicated energy crops. Many generations of research, experience, and improvement of traditional cropping systems have contributed to the highly efficient systems and infrastructure in place today. We have all of the same needs for dedicated energy crops, only on a much faster track. Significant research is needed in crop breeding, crop genetics, agronomic practices, crop management systems, harvesting methods, production and harvesting equipment, preprocessing, transportation,

storage, risk management, and contracting, to name a few. All of this research and development in energy crop production, harvesting, and management must be integrated into sustainable cropping systems that are then integrated into biorefinery systems.

Sustainable systems are imperative. While the potential benefits and gains from a highly developed agricultural and forestry based renewable energy sector are tremendous, care must be taken to ensure that expansion and development of the agricultural sector to meet the needs of the bioeconomy is handled in a way that is consistent with sustainable land use. Clearly, there is a danger of a wrong approach to developing the feedstock supply systems. It is essential to the long-term viability of the bioeconomy that the agricultural sector produces a sufficient quantity of the most appropriate feedstock in an environmentally sustainable manner, using the best available production and management and labor techniques.

Energy crop solutions are region-specific. In current biorefinery economic models, feedstock costs are a significant component—about half—of total manufacturing costs. The high costs of transporting bulky biomass material limits the distance from which the feedstock material can be cost effectively transported to the processing site. Thus, feedstock supply systems must be developed that are the best fit for local conditions, resources, and infrastructure.

Supporting the Developing Cellulosic Biofuels Industry

Bioeconomy growth is on a fast track, but it will not happen overnight. We have the opportunity now to make investments in developing and growing a skilled and sufficient workforce for the bioeconomy, in a manner that is sustainable and maximizes benefits, especially for rural and agricultural communities. But we must start now.

Land-grant colleges and universities have an important role to play in the developing biobased economy. The three primary functions on which they are built—research, education, and Extension—are all critical to successfully achieving the bioeconomy vision. Importantly, the land-grant college and university system effectively integrates all three functions, and this integration is also necessary for development of a viable and sustainable bioeconomy. The Agricultural Extension Service is uniquely positioned at the ground level in communities where they can deliver technical information and education to farmers and the public. They have a long history of working with farmers to implement new technologies and programs, and are an effective tool for rapidly disseminating information in the communities where they live and work.

Investments in research to support this emerging industry are also critical to its success. There are lots of unanswered questions ripe for research. And it is entirely possible that a thriving cellulosic biofuels industry 10 years in the future will not look much like we have it pictured today. Research programs need to be flexible by design, able to incorporate new advances and technologies into future research efforts. The Sun Grant Initiative, providing a regional-based approach to coordinating and supporting bioenergy and bioproducts research efforts through land-grant colleges and universities, is an example of using existing research infrastructure to

focus research efforts toward common regional bioeconomy goals. It is also important that research efforts leverage both public and private sector investments and strengths.

Training the next generation of cellulosic biofuels researchers and workers requires tailored graduate and undergraduate curricula that largely still need to be developed and implemented. As one example, a new joint graduate biomass conversion curriculum effort is underway through the BioSucceed project, a combined effort involving North Carolina State University, the University of Tennessee, and North Carolina A&T University, supported by a USDA Higher Education Challenge Grant. Through this innovative curriculum development effort, not only are courses and learning modules being developed, but they are being freely shared with the larger academic community to encourage other institutions and instructors to efficiently and rapidly adapt and adopt the material into their own programs and courses.

Community colleges and technical schools will also have an important role to play in training workers for the biofuels industry and improving the skills required of this growing workforce. Expanded demand for biofuels industry workers should be concurrent with expanded technical offerings. The educational transformation required to smoothly achieve the bioeconomy vision begins in the earliest stages of our educational system. Further emphasis is needed in our K-12 math and science curriculum that will prepare young people for future career opportunities in chemistry, biology, informatics, engineering, and other related fields.

Thank you again for the opportunity to appear before you today. Today's hearing on workforce needs in the evolving bioenergy industry makes a dramatic statement about the importance this Committee places on accelerating the development of domestic renewable energy and fuels. I believe that we are on the verge of a dramatic transformation in the bioenergy industry, as we are now looking to our farms and ranches and forests to supply biomass material for conversion to cellulosic biofuels and biopower. As we press toward this worthy goal, it is critical that we ensure that a sufficient workforce—in both the agricultural and manufacturing sectors—is available and trained to meet our growing bioenergy needs in a sustainable way.

Testimony of Colin South
President, Mascoma Corporation
Before the House Small Business Committee's Subcommittee on Contracting and Technology
June 20, 2007

Mr. Chairman and Ranking Member Davis, I am pleased to be here today to testify on behalf of Mascoma Corporation on this important issue of *Meeting the Workforce Needs of Small Bio-Energy Businesses.*

Mascoma Corporation is a low-carbon cellulosic biomass-to-ethanol company with offices in Cambridge, Massachusetts, and Research and Development labs in Lebanon, New Hampshire. Mascoma is focused on commercializing cellulosic ethanol technologies that will work in every region of the country. We believe it is critical to develop multi-state feedstock availability and logistics alongside distribution channels and consumer markets. *Fueling Locally*—rather than trucking fuel from across the country or globe—will be an important component of our nation's future energy strategy.

Mascoma is developing advanced cellulosic ethanol technologies in its own labs, partnering with several academic institutions to further research in the conversion of cellulosic biomass, and developing demonstration and commercial scale production facilities in several locations including facilities in New York and Tennessee.

As Mascoma looks to site cellulosic ethanol facilities, strong partnerships with local academic institutions play a critical role. This, in part, comes from our beginnings. Dr. Lee Lynd and Dr. Charles Wyman from Dartmouth College in Hanover, New Hampshire founded Mascoma. But, it also is borne out of necessity. Unlike other bio-energy businesses such as corn-based ethanol, the academic needs go beyond simply training workers to work at an ethanol biorefinery. We need individuals who can help us solve the remaining hurdles to decreasing the cost of production of cellulosic ethanol, and our nation's academic institutions are poised to help us do so.

Specifically, cellulosic ethanol facilities have several additional needs that require the focus of our post-secondary educational system. These include expertise in feed stock cultivation and regional agronomics with an energy crop focus, feedstock aggregation and handling, and unique processing and operations of cellulosic ethanol facilities. This last part is especially important because of the variety of feedstocks that cellulosic operations can accommodate—even within a single plant—will require a more sophisticated workforce.

Mascoma continues to find talent from Dartmouth for our own labs in Lebanon, New Hampshire. There we are focused on the development of commercial scale cellulosic ethanol production, including Consolidated BioProcessing (unified microbial process to digest and ferment cellulosic material), fermentation development, and process support. In addition to our work with Dartmouth, we are also working with the University of California Riverside on pretreatment research at our labs in Lebanon.

In Tennessee, Mascoma is working with the University of Tennessee and Oak Ridge National Laboratories on the development of a cellulosic biomass to ethanol production facility in Eastern Tennessee. Initial research conducted by the University of Tennessee's Institute of Agriculture indicates that Tennessee is capable of generating over one billion gallons of cellulosic ethanol from switchgrass alone. The University of Tennessee is committing research funding and lending valuable expertise to this project. Among other benefits, this project will: further the economic development of the State of Tennessee, create investment opportunities for rural farmers, and attract future research dollars to the state.

In New York, Mascoma is working with the State of New York to design and build a demonstration-scale cellulosic ethanol plant capable of piloting new technologies and processes across multiple feedstocks. In addition to the state government, we are partnering with Cornell University and Clarkson University to focus on development of feedstock supply chains and aligning the efforts of academic institutions with regional development initiatives.

Policymakers have set very aggressive – yet achievable -- goals for the growth of the cellulosic ethanol industry. Today, the Senate is debating an energy bill that would mandate the use of 3 billion gallons of cellulosic ethanol in 2016, growing to 21 billion gallons in 2022. This ambitious ramp up in cellulosic ethanol production will require an equally rapid ramp up in funding for our nation's schools.

This country's schools of higher education need an infusion of funding to continue the important research and development of cellulosic technologies. For example, in 2003, Congress enacted and the President signed in to law the Sun Grant Research Initiative designed to enhance the efficiency of bioenergy and biomass research and development programs through improved coordination and collaboration between the Department of Agriculture, the Department of Energy, and the land-grant colleges and universities. The University of Tennessee was named as one of the five regional centers to foster this critical research.

The legislation authorized $25 million for fiscal year 2005; $50 million for fiscal year 2006; and $75 million for each of fiscal years 2007 through 2010 for the Sun Grant Initiative. So far, the Sun Grant Initiative has received $50 million total. Congress should do more for this initiative and for research funding in general as it debates the Farm Bill this year.

Beyond providing valuable research, our nation's academic institutions will also be asked to train the next generation of bio-energy workers. At least initially, cellulosic ethanol is intrinsically more labor intensive than corn-based ethanol and will likely require twice as many full time employees than corn-based ethanol facilities. Schools across the country will be asked to train these workers.

To this end, the Federal government should focus additional resources in helping schools build programs and curriculum to do so. Mr. Chairman, we applaud your interest in this area and appreciate the focus you have brought to this issue with your legislation authorizing the Secretary of Agriculture to make competitive grants to community

colleges to support the education and training of technicians in the fields of bioenergy. We think the Federal government must do more, and I hope that this type of program can be included in the Farm Bill on a national basis.

In conclusion, we at Mascoma are excited about the future of the cellulosic ethanol industry and appreciate this Subcommittee's efforts to help us solve our nation's energy security needs, while creating new opportunities in rural America.

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