



Greater Philadelphia Innovation Cluster
for Energy-Efficient Buildings
A U.S. DOE Energy Innovation Hub

An aerial photograph of Philadelphia, Pennsylvania, showing the city skyline in the background with several prominent skyscrapers. In the foreground, there are various buildings, including a large brick building with a gabled roof and a modern multi-story office building. A body of water is visible in the lower portion of the image, with a pier and a small boat docked.

**Educator's Conference for Subject Matter Experts and
Leaders- Conference Report
October 20, 2011**

**Greater Philadelphia Innovation Cluster (GPIC) for
Energy-Efficient Buildings**

Education and Workforce Development Task

Report Title: Educator's Conference for Subject Matter Experts and Leaders- Conference Report

Date: October 20, 2011

Task area: Education and Workforce Development

More information: <http://gpichub.org>

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Background:

The Greater Philadelphia Innovation Cluster (GPIC) for Energy-Efficient Buildings is a consortium of academic institutions, federal laboratories, global industry partners, regional economic development agencies and other stakeholders that joined forces to secure up to \$130 million in federal grants, including \$122 million from the Department of Energy to establish an Energy Innovation Hub. The Commonwealth of Pennsylvania has also committed \$30 million of new capital funding to support GPIC facilities at The Navy Yard. The funding will foster national energy independence and create quality jobs for the region.

The goals of GPIC, located at The Navy Yard in Philadelphia, are to improve energy efficiency and operability and reduce carbon emissions of new and existing buildings, and to stimulate private investment and quality job creation in the Greater Philadelphia region, the larger Mid-Atlantic region, and beyond. The GPIC will focus on full spectrum retrofit of existing average size commercial and multi-family residential buildings.

GPIC is supported by over 70 partners from industry associations, workforce investment boards, economic development agencies, banks and financial institutions and community organizations.

GPIC activities are organized into 6 task areas:

1. **Design Tools-** The goal of this task is to deliver accessible and affordable, calibrated and validated computer based tools built on open architecture to support integrated design of energy efficient retrofit projects by architects and engineers focused on average size commercial and multi-family residential buildings.
2. **Integrated Technologies-** The goal of this task is to develop and deliver optimal configurations of integrated technologies and system solutions for energy efficient retrofit of commercial buildings of varying functionality, size, and aspect ratio, as well as multi-family residential buildings.
3. **Policy, Markets and Behavior-** The goal of this task group is to create public policy and business market environments that support full-spectrum energy efficient retrofit of average size commercial and multi-family residential buildings in Greater Philadelphia.
4. **Education and Workforce Development-** The goal of this task is to ensure a skilled workforce at all levels in the energy efficient buildings sector in Greater Philadelphia.
5. **Deployment and Commercialization-** The goals of this task are to transform the building industry from a serially fragmented method to an integrated systems approach and to create new jobs in Greater Philadelphia
6. **Collaborative Demonstration Projects-** The goals of this task are to demonstrate performance of GPIC coordinated system integrated and operational technologies, policies, business models, workforce development approaches, and process integration methods in retrofitting of buildings at the Navy Yard and other sites in the Greater Philadelphia region.

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This material is based upon work supported by the Greater Philadelphia Innovation Cluster (GPIC) for Energy-Efficient Buildings an energy innovation HUB sponsored by the Department of Energy under Award Number DE-EE0004261.

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Executive Summary

On October 20, 2011 more than 60 educators and industry representatives came together in Building 101 at the Navy Yard to forge connections, discuss the state of the energy efficient building industry is today, what role educational institutions can play to help drive the market, and how to bridge the transition. This meeting was intended to begin discussions among regional educators, GPIC, and business leaders around the goals of GPIC.

As **Joseph P. Welsh**, CEO of Collegiate Consortium, framed the day, "We need to transform the energy efficiency industry from serial fragmentation to integrated systems. Doing this will require a systems approach to education, which will demand that we break down our silos and begin to educate across functions." Welsh invited participants to view the day's discussion through a lens of transformation.

Conference Conclusions

1. The building industry needs a trained workforce and there are clear education gaps, particularly on cross-functional skills.
2. Educators have students who need jobs.
 - a. Educators are interested in working across institutions and collaboratively with business to bridge the gap.
 - b. Focusing on energy auditors will create jobs for engineers, design professionals, materials manufacturers and distributors.
3. Community colleges now offer related programs.
 - a. Most programs are at the certificate (rather than degree) level. Degrees are importantly already including a hands-on component or apprenticeship.
 - b. Educators stress the importance of standards and third party certification (e.g. Building Performance Institute).
4. Educators and industry leaders will need to partner to develop more integrated cross-functional programs to prepare students for the field.

Next Steps

Welsh invited attendees to continue their participation in GPIC and to attend an upcoming 2-day workshop offered by Penn State on *Energy Efficiency Auditing Essentials* to advance the dialog on how to integrate the required skills academically.

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Introduction

On October 20, 2011, over 60 educators and industry leaders gathered for GPIC's first Educator's Conference on Energy Efficient Buildings. GPIC's Education and Workforce Task organized the day to focus on GPIC's goal to transform the building industry to support increasing energy efficiency and to build an educated workforce ready to participate in the transformation. The conference focused on three core questions:



- Where is the industry today?
- What can educational institutions do to gear up and help drive the market?
- What can educators and industry do to bridge the transition?

The day was kicked off by **Joseph P. Welsh**, CEO of the Collegiate Consortium and a leader of the GPIC Education and Workforce Development Task. He identified GPIC's core goal: to transform the regional building industry, increase energy efficiency of regional buildings. He emphasized the importance of taking a systems approach to retrofitting existing buildings in order to cost effectively achieve a 50% reduction in energy use.

Welsh issued a call to action by saying "You cannot transform industry practices without the leadership and expertise of our region's educators and trainers, and that is why you are all here today." Welsh encouraged all present to view this day as a call for transformation, and it was through that lens that the day's sessions began.

Will Agate, Vice President at the Philadelphia Industrial Development Corporation (PIDC), gave an overview of the Clean Energy Campus at the Philadelphia Navy Yard. He highlighted the dynamism of the Navy Yard and its on-going commitment to forging partnerships and community. He invited participants to use the Navy Yard as a living laboratory.

"We think of this place as a unique opportunity to be a test bed," Agate said. "This is a place where all of you in this room and the 10-county region of GPIC can come to demonstrate what can be done [on energy efficiency in buildings], and then do it regionally, and then nationally."

Christine Knapp, Manager of Public and Client Relations for GPIC at Penn State University (PSU) followed to provide an overview of GPIC and the opportunities to engage going forward.

The Greater Philadelphia Innovation Cluster (GPIC) for Energy-Efficient Buildings is a consortium of academic institutions, federal laboratories, global industry partners, regional economic development agencies and other stakeholders that joined forces to secure funding from seven federal agencies to establish an Energy Innovation Hub. GPIC's goals are to improve energy efficiency and operability, and reduce carbon emissions of new and existing buildings, and to stimulate private investment and quality job creation regionally and beyond.

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GPIC focuses on full-scale retrofit of average-size commercial, institutional and multi-family residential buildings. "Average-size" ranges from about 20,000 to 100,000 square feet. Retrofit is the solution sought because existing buildings consume about 40 percent of the nation's energy use. Pursuing retrofit through an integrated approach (addressing systems rather than components) will require a shift in the industry and education.

She noted that a variety of industries have made huge improvements in energy efficiency over the last 30 years, but the building industry lags behind.

GPIC aims to provide methods that can be implemented over the next ten years that improve energy efficiency in buildings by 50 percent. This payback will require private investment and quality job creation.

Knapp highlighted the retrofit and renovation of Building 661 at the Navy Yard. It will serve as the new GPIC headquarters and a living lab and demonstration site.

The next speaker was **David Riley**, Associate Professor and Executive Director of the Center for Sustainability at Penn State University, who explained the mandate of the Education and Workforce Task.

The goal for the Education and Workforce Team is to assure that new innovative energy efficiency technologies and systems are supported by a robust human capital infrastructure and a workforce educated in systems thinking across functions.

This task has created six target deliverables.

1. Develop and deliver programs to train a group of BPI-certified **building energy auditors**. Energy auditors are the lynchpin in the value chain in that they will create markets for a host of other roles (e.g. designers, engineers, tradespeople, etc.) that will have exponential returns.
2. Develop new curriculum for improved training of building trades workers in energy efficient building systems. Riley views this goal as really **empowering instructors** to embed energy efficiency curriculum into their courses and pulling together best practices and curriculum modules.
3. Create **pathways** from secondary schools to certificate and associate degree programs to baccalaureate and graduate programs in energy efficiency systems.



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4. Establish **training and certification program for building operators**. Riley sees building operators as an important catalyst for industry transformation. "We still have building owners that accept proposals for buildings that are inefficient," he said. "We've got to stop building bad buildings. We need owners to demand energy efficiency."
5. Leverage Building 661 project and other GPIC demonstration projects to **create programs to prepare secondary students** for post-secondary programs in energy efficient building systems.
6. **General outreach** to educate building owners, occupants, operators and the general public about building energy efficiency and attract members of underrepresented groups to participate in building science education and training at all levels.

The Education and Workforce Development Task is led by Andrew Zwicker, Head of Science Education and the Princeton Plasma Physics Laboratory at Princeton University, and is supported by David Riley (Penn State), Joseph Welsh (Collegiate Consortium), Anthony Girifalco (Delaware Valley Industrial Resource Center) and Avis Ransom (Morgan State University).

Speaking next, **Bill Sisson, Director of Sustainability at United Technologies Research Center (UTRC)** gave an overview of the market model for efficiency in the built environment. He has worked with the World Business Council on Sustainable Development (WBCSD) to understand where markets are now, how they might transform and what policy might be needed to bring about change.

WBCSD surveyed 1500 building professionals and identified a market failure. "The market doesn't understand its energy consumption," he said, "and it overestimates the cost of retrofits by about threefold." Market transformation in energy efficient buildings is a \$190 billion market opportunity. Sisson compared the change we need in energy to other regulations already enacted and the relative cost of doing so. He showed that investing in energy efficiency in buildings will require about a 13 percent first cost for the industry, and will result in about a 3 percent increase in costs to society. This is in line with other improvements to health and safety, such as auto safety standards (2 percent increase in costs to society) and Building Fire Safety Regulations (5 percent increase in costs to society).

Sisson also pointed out the unique economic opportunity of building retrofits. Energy improvements can yield 40 percent returns with paybacks of 5 years or less. "That's about a 20 percent ROI," Sisson said. "You can't get that return on any other investment available today." It also creates a variety of sources of employment: installation/construction labor; design, equipment and materials; and redirected spending that result from energy efficiency cost savings.

He highlighted an upcoming report by Econsult evaluating the market in the GPIC 10-county region. Important features included:

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- The region has about 400 million square feet of average-size commercial building stock.
- Philadelphia energy spend is about \$2.84/sq. ft. compared to national average of \$2.21 and the 4th highest in the nation.
- The regional retrofit market should conservatively create 9,000 to 12,000 jobs, Sisson believes many more are likely.

Current Business Practices and Marketplace – Business and Industry Perspectives

Therese Flaherty, Director of the Wharton Small Business Development Center served as Panel Moderator.



The panel was designed to highlight a broad range of owners, operators, industry advocates, consultants and practitioners from across a variety of sectors. PREIT and Liberty Property Trust are large, private commercial real estate firms that deal with third-party tenants, whereas Penn and the School District of Philadelphia are both owner-operators and deal with different resource and staffing constraints. Together the panelists own and/or operate over 150 million square feet in the region.

A small business perspective was included from the PA Small Business Development Center, a representative from a key industry group – the Association of Energy Engineers – and a private contractor, who works with a variety of property owners regularly and can speak to the unique issues faced in the field.

Panelists included:

- **Ken Ogawa**, *Executive Director of Operations, University of Pennsylvania*
- **Jeffery Cardwell**, *Senior Vice President of Facilities and Operations, School District of Philadelphia*
- **Frederick W. Dougherty**, *Vice President of Portfolio Technology, Liberty Property Trust*
- **Justin Rosenberg**, *Manager of Energy Services, Asset Management Department, PREIT Services, LLC*
- **Nancy Crickman**, *Director, Environmental, Energy and Technology Services, PA Small Business Development Center*
- **Lou Nazirides**, *ProTech Energy Solutions, Association of Energy Engineers*
- **Michael A. Brown**, *CEM, Environmental Construction Services, Inc.*

What are you and others investing in now and what do you expect to be doing in the next few years related to energy efficient buildings?

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The panelists expressed a number of common themes. These are all efforts that the panelists have already begun and will expand in the coming years.

1. **Commissioning/Re-Commissioning:** Commissioning is a review process to ensure that a building runs to its design specifications. Both Penn and the School District of Philadelphia have increased commissioning efforts and are continuing to expand them.
2. **Energy Monitoring:** Throughout the industry it is well-recognized that simply having a better understanding of energy use results in a reduction in consumption. Fred Dougherty from Liberty Property Trust saw indirect savings of 7.5 percent on his energy monitoring project.
3. **Demand Response and Energy Procurement:** Justin Rosenberg of PREIT called both of these projects “a homerun.” Demand response projects require education of the occupants and building managers, but when implemented allows a third party to remotely reduce energy consumption during periods of peak usage.

Michael Brown of Environmental Construction Services, Inc. mentioned that understanding utility rates for energy procurement is key. “Energy management is about both reducing energy and reducing costs,” he said.

4. **Low and No-Cost Efficiency Projects:** These often include installing occupancy sensors, efficient exit signs, and behavior change, said Nancy Crickman of the Pennsylvania Small Business Development Center. Crickman and Dougherty both highlighted that sometimes the low-hanging fruit includes mistakes on utility bills or faulty meters that would not have been caught without energy monitoring.

Lou Nazirides of ProTech Energy Solutions referred back to the 20 percent return on investment Bill Sisson mentioned earlier. He says that 0 to 10 percent savings can be had by the low-hanging fruit which require little or no investment, but the 10 to 20 percent savings generally require capital investment.

Panelists expressed a number of challenges and opportunities for moving forward to more advanced energy efficiency projects.

1. **Education and Behavior Change:** Jeffery Cardwell believes the School District could save 5 to 8 percent in energy costs through behavior change alone, and teaching children about energy efficiency will have exponential impact.



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Dougherty said that energy reduction projects must be done keeping the tenants' expectations and reactions in mind and that education will be an important part of evolving those expectations, particularly when it comes to demand response programs.

Rosenberg stressed the importance of education across the organization from trades to executives, particularly in order to make the business case for capital expenditure on efficiency projects.

Ken Ogawa explained Penn's Eco-Reps program, which trains staff to educate others on behavior change. Jeffery Cardwell is currently working to train 40 mid-level staff to become trainers of other staff, similar to Penn's Eco-Reps.

Ogawa noted that HR does not incentivize middle management to make change related to energy, which will ultimately have to change.

2. **Measuring Impact:** Ogawa from Penn mentioned that he normally includes only direct costs in payback calculations, but we must get better at measuring the indirect cost implications as well.

Dougherty mentions he worked very closely with his Chief Financial Officer this past year to measure indirect savings from a monitoring project that was very successful. Involving the executive level was critical.

Rosenberg noted that making the business case for projects with high first costs and a payback based on indirect cost implications can be difficult.

3. **Integrating Systems and Cross-Training:** Brown highlighted issues across building systems. For example, technicians are often trained in the language of only one brand of building automation system (BAS) and don't understand others across a portfolio, or building managers don't understand how their particular BAS runs.

Nazirides said the energy management industry demands strong knowledge of stakeholder management in addition to service-side engineering. Engineers need to know how to make the business case for a project and what levers to pull to convince each stakeholder.

4. **Financing:** There are a number of ways to finance energy efficiency projects but there are a number of challenges. At Penn, they have created an Energy Reduction Fund through which building managers can apply for project funds.

Traditional Energy Services Companies (ESCOs) exist and minimize or eliminate up-front costs but according to Nancy Crickman, tend not to work much with small businesses.

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Rosenberg pointed out that incentives vary from state to state, so for example, he has focused on solar energy projects only in Massachusetts and New Jersey since Pennsylvania's incentives are significantly less valuable.

Crickman mentioned that market confidence in energy audits is low due to inconsistency across auditors and hence financing opportunities from traditional sources can be limited. Standardizing credentials would go a long way towards increasing the availability of financing.

Crickman provided data from a recent study she did of PA SBDC clients' energy efficiency projects and their returns. Her team has completed 900 energy audits of small businesses.

Type of Project	% of Total Projects	Average Payback (in years)
HVAC	39%	3.4
Lighting	23%	2.6
Equipment upgrades	14%	4.7
Building envelope	13%	4.1
Compressed air, peak demand and others	11%	Varies

What kinds of skills are needed now and where does the market need to change? What is the gap?

- 1. Building Controls, Automation Systems:** Both Cardwell and Ogawa mentioned they can't find the controls people they need with the right training. Cardwell has two Automatic Temperature Control techs and had to create internal training for those jobs. Ogawa has had a similar experience. He has advertised jobs in Controls multiple times and has received no applicants. Instead now he trains steamfitters and A/C mechanics to do this job and the training takes two years. Both find it important to certify graduates on multiple controls systems across manufacturers.
- 2. Cross-Functional Skills** Brown sees a demand for students graduating with hands on experience across functions including blueprint reading, computer aided design (CAD), and finance skills including payback, Return on Investment (ROI) and Life Cycle Analysis.

Dougherty agreed that education can't continue to be so siloed anymore. He notes that high-performance buildings require knowledge in facilities management, energy procurement, building controls, and IT standards.

Ogawa mentioned that customer service, supply clerks and call center folks all need to be cross-trained with the building trades in order to understand what it means when people call with a problem.

- 3. Re-training Existing Skills:** Brown notes that engineers are taught to design a building against the most extreme degree day situations. It would be much more efficient to train engineers to design redundant systems for extreme weather days. They would already do it if they were trained to take cost and performance into consideration.

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4. **Measurement and Verification:** Measurement and Verification must go beyond the traditional Testing and Balancing (TAB) analysis and reach across functions. For energy projects, standardized measurement and verification can make the difference between success and failure, and affects the ability of staff to continue to convince decision-makers to invest in energy efficiency projects.
5. **Finance and Incentives:** Crickman pointed out very few contractors are trained on what the tax, grant and other government incentives are related to the equipment you buy.

Rosenberg noted the importance of understanding the market dynamics and risk profile of energy opportunities and be able to communicate that to stakeholders.

6. **Communications and Leadership:** Ogawa said 85 percent of his union workforce is over 50 years old. As they begin to retire, he has to hire new tradespeople that can jump into leadership roles in the organization very quickly. He says he often receives thousands of resumes for a job posting, and candidates need something that sets them apart. He highlighted good (or in some cases any!) résumés, hands-on experience through internships or temp jobs and certifications from manufacturers all can give the candidate an advantage. He also mentions that he is increasingly using smartphones and iPads and needs tradespeople who are comfortable with the newest communications technology.
7. **Energy Procurement:** Dougherty would seek out graduates trained as Energy Procurement Specialists, and notes this type of specialty would need to also give students the basics on real estate and finance fundamentals.

The audience mentioned that community colleges in this economy are serving populations ranging from certificates and degree programs to PhDs who are coming back for specific skills. The panelists expressed strong interest in a public-private partnership for training and placement.

Joe Welsh provided the summation for the panel. “There are no easy answers,” he said. “But there are opportunities.” Educators are eager to train students in what is needed in the workplace and industry wants to place them. This is the first step to the dialogue.

Education and Workforce Development in the Energy Efficient Building Sector

Over lunch, participants were buzzing, building connections and sharing experiences. Going into the lunchtime educational session, discussion focused on where the jobs are, what training we need and how to



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start providing it. Educators were already beginning to build partnerships, share success stories and relate challenges.

The lunchtime session was presented by **David Riley**. Riley gave an overview of GPIC's approach to tackling the education and workforce issue and its priorities for 2012.

In a recent conversation with Lou Nazirides, Riley recounted that Lou said, "This is great but this opportunity has been around for 10 years. What's taking you guys so long?" He has created some training capacity and educational programs in energy efficient buildings at Penn State but, in Riley's words, "we have a long way to go."

GPIC's Approach

GPIC views the issue across delivery platforms such as K-12, technical and trade schools, and community colleges. It also looks across building workforce sectors such as the skilled trades, systems technicians, design professionals, accounting and finance, HR, and project management.

GPIC is moving forward while recognizing a number of key factors in the existing marketplace (sample below).

- The energy efficiency workforce sector is larger than the new building sector.
- Workforce needs are vertically distributed across professional and skilled trades.
- We are in a climate of high unemployment and low confidence.
- Existing workforce has experience and belief systems that will create barriers to change.

GPIC mapped critical gaps in the workforce and prioritized top jobs. They were:

- Building Energy Evaluation and Auditing
- Integrated Design Management
- Building Operator/Automation Technician
- Electrical Systems Design and Construction
- General Science and Engineering

Standards need to be developed to best understand what these categorizations mean. Just the day before, the federal government released draft job task analyses for a number of key jobs, including those the Riley mentioned here. He recommends reading through them at

www.buildings.energy.gov/workforce.html.

GPIC's 2012 Priorities

This year, GPIC's Education and Workforce task will focus on four priorities.

1. Building Energy Auditors



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- GPIC sees Energy Auditors as the key job creators for other sectors including engineering, finance, service/contractors, retail/wholesale materials sales and more.
- There are three levels of Energy Auditor competencies:
 - *Screening audit* (identify key indicators of retrofit potential)
 - *Whole Building audit* (look at utility bills, equipment types, control features, use patterns, energy rate structures and develop a basic energy model, some systems diagnostics)
 - *Investment Grade Audit* (evaluate proposed redesign for economic performance, risk and expected ROI)

2. Building Operators
3. Integrated Design Professionals
4. Defining pathways from K-12 through continuing education

Best Practices – Case Studies

Riley highlighted a number of case studies that reflect best practices from educators to help advance those priorities.

- National Electrical Contracting Association (NECA) has created a screening and advanced energy auditing course and an online support tool for auditing.
- Community College of Philadelphia has developed a hands-on residential energy apprenticeship.
- Laney College in Oakland, CA has a building automation training laboratory that trains across all kinds of controls systems and employs problem-based learning modules, which are far more hands-on and effective for this type of education.
- Delaware Technical and Community College partnered with Lane Community College in Eugene, OR to implement a building energy program. Riley cites this as a great example of sharing curriculum content and strategies.

Riley encouraged educators to take advantage of the National Training Education Resource (NTER), created by DOE to provide online training infrastructure for free to schools nationwide on building energy efficiency topics. Learn more at www.nterlearning.org.

Educational Perspectives: Reflections on Marketplace Demand and Program Development

The day's final panel was moderated by **David Riley** and began with a report from **Gary Hines** of Delaware Valley Industrial Resource Center (DVIRC), who has been working on a sector Asset Map to identify the programs and resources already out there.

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In designing this panel, care was taken to ensure a representative sample of community colleges from across the region and focused on three key distinctions:



1. **Location:** Is the institution urban, suburban or rural? Are they located geographically across the region? Does that impact the kind of training they provide given the variety of building stock in their location?
2. **Client/student populations:** These schools represent diverse populations that include students straight out of high school, corporate training programs, and unemployed professionals at all levels seeking to re-tool or add skills, and students seeking 2-year degrees, 4-year degrees and those seeking a variety of certifications and hands-on experience.
3. **Availability of energy efficiency offerings:** We felt it was important to foster a discussion among schools with very developed programs as well as those considering creating new curriculum.

Panelists included:

- **Sivaraman (Anbar) Anbarasan**, *Camden Community College*
- **Miles Grosbard**, *Community College of Philadelphia*
- **Christine Gillespie**, *Bucks County Community College*
- **Ray Constantine**, *Salem Community College*
- **Ketan Gandhi**, *Burlington Community College*

Asset Map

Gary Hines provided an overview of the first phase of DVIRC's Asset Map, which will be available November 2011. Phase 1 included outreach to 2-year institutions and community colleges, while Phase 2, out in January 2012, will focus on 4-year institutions, select organizations and labor unions.

During this outreach, 73 percent of institutions listed corporate training as their primary customers. Some schools are offering certifications, the most common being Building Performance Institute (BPI) certification which focuses on residential energy efficiency retrofits. Students have not expressed very high demand in energy efficiency programs because they don't see the pathways to immediate employment. The most popular career paths at the moment are ones with perceived employer demand and often, some aspect of pop culture popularity: Crime Scene Investigators, Automotive, Cosmetology and Culinary Arts. DVIRC found that there was clear consensus among educators and industry that pathways development is needed.

Current Energy-Related Offerings from Panel Institutions

The panel agreed that in the current economy, interest in Associates Degrees has waned and some schools are switching gears to offer faster certificate programs that will allow people to re-tool their skills as quickly as possible and get back out to the workforce. This was particularly true at Salem Community College, where Ray Constantine mentions they have created PV and solar thermal training, non-credit and credit training programs. He has a partnership with the New Jersey Department of Labor in which employers can apply to the state for a grant to train employees, particularly as BPI Energy Analysts, HVAC and NABCEP-certified solar technicians.

At Community College of Philadelphia, Miles Grosbard highlighted their new residential energy apprenticeship program and their hands-on training center shared with the Energy Coordinating Agency. Grosbard also mentions that CCP has an Associate of Facilities Management degree that is certified by IFMA and has graduated about 50 people.

All schools agreed that employment rates from energy-related programs lately range from 30 to 50 percent of graduates.

Chris Gillespie from Bucks County Community College highlighted their electrical apprenticeship program, which also has a solar component. At BCCC, they combine that apprenticeship with energy efficiency work, a BPI certification and in some cases, additional mechanical systems skills for facilities managers. She has a program in Programmable Logic Controls (PLCs) and has employers that are seeking graduates in that field but is having a hard time recruiting students into the program.

Ray Constantine from Salem Community College reviewed their sustainable energy technology degree program and mentioned they are currently working on two new certificate programs in sustainability and other energy-related fields.

Barriers, Challenges and Opportunities

All panelists agreed that students are not arriving at their institutions prepared in or comfortable with math skills. All felt as though adding a math requirement to degree or certificate programs would be a detractor for students. Ketan Gandhi from Burlington Community College mentions they have not yet implemented an energy auditing certificate or degree program out of the fear that a pre-calculus prerequisite would be a problem for students. Most panelists felt geometry and basic math was more important than pre-calculus for this field.

To solve both the content and marketing issues, David Riley mentions that at Penn State, they developed a module called Solar Math that focuses on the exact types of math skills required in the solar industry. Anbar Anbarasan from Camden Community College echoed a similar requirement at CCC that teaches 40 hours of math and electricity basics in their solar program.

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Miles Grosbard from CCP noted communications, safety and code knowledge should also be integrated. Chris Gillespie notes that applied math and problem-based approaches may be most effective in this industry, giving an example of a veterans program run at BCCC in which she found that timed paper and pencil tests were ineffective and didn't adequately measure competence, but small group problem-solving challenges were much more reflective.

The audience expressed interest in the transition from residential skills to commercial ones, and most panelists thought the skills were transferable at a basic level.

Final Thoughts

Joe Welsh provided a summary to close the event. He thanked the panel, and highlighted the breadth and depth of opportunity. He expressed particular thanks to Andrew Zwicker and the Princeton Plasma Physics Laboratory. Special thanks were given to Michael Pahides, Gary Hines, Leslie Robinson, Therese Flaherty, David Riley and the whole team at GPIC.

"Our goal is to make you a success," said Welsh. "We will work really hard over this next year to understand how we can pilot programs, reach out into the marketplace and build pathways together."

This conference demonstrated the need for transformation of the market, began stimulating and engaging conversation on the value of the energy efficient buildings sector in our region and highlighted some of the gaps in workforce development that will need to be (and already are being) filled in order to move the sector forward. The seeds were planted here for on-going dialogue between educators and industry that will ultimately help re-tool and train the regional workforce to meet the growing needs of the energy efficient buildings sector.

