

Preparing the Smart Grid Future

Great Lakes Smart Grid Symposium

September 24, 2014

Overview

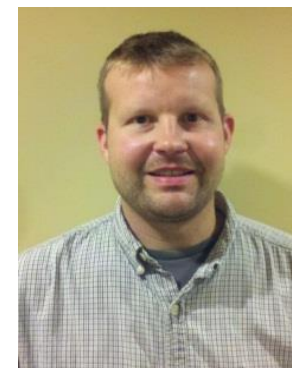
- The Need
- The Approach
- Filling the Gaps and Next Steps Discussion
- Q&A

Panel Introductions

David
Loomis
Illinois State
University



Chris
Miller
Heartland
Community
College
Company



Bob Clark
College of
DuPage

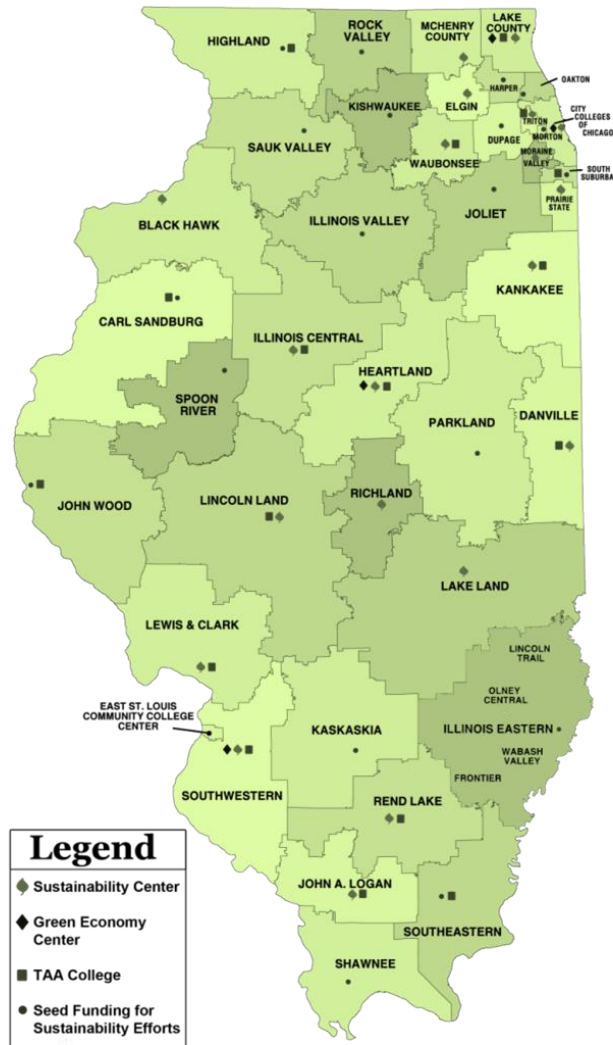


Marcia
Lochmann
Illinois Green
Economy
Network



Illinois Green Economy Network

To provide a platform for collaboration among all Illinois community colleges and their partners to drive growth of the green economy.



Leveraging the Power of the Community College Sector

Proof in the Numbers

- The 48 Community Colleges of Illinois welcome more than one million (1,000,000) students through their gates each year.
- Over 650,000 are enrolled in certificate programs
- The Illinois Community College System is the third largest in the United States.

Community Colleges will Drive the Green Economy

- Green workforce training and certification
- Green curriculum
- Green small business support
- Campus demonstration
- Community engagement

IGEN and Smart Grid Education

2012

- Smart Grid Working Group

2013

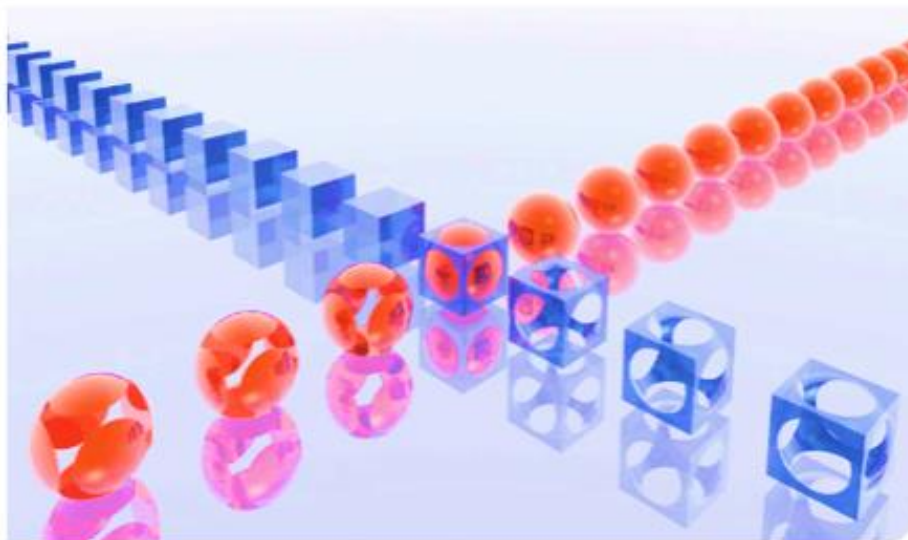
- Smart Grid Instructional Classrooms

2014

- Consumer Engagement Program Development
 - Website
 - Kiosks
 - Consumer facing equipment

The U.S. Smart Grid Revolution

Smart Grid Workforce Trends 2011



Job creation and development of industry native to the United States is a national priority. Smart grid continues to be a primary example of a technological area that is ripe with opportunity and ready for continued innovation and creativity.

- > Smart grid will expand opportunities in the electric energy industry as a whole, presenting an opportunity for the U.S. to develop a strong native industry around development, deployment, maintenance, and servicing of smart grid infrastructure and technologies
- > Strong investment continues to flow into the smart grid sector, opening new, stronger job opportunities
- > Redefined job requirements are opening opportunities for current employees and for those who will replace them in the future.

KEMA

Preparing Smart Grid Job Growth

- shifting requirements of existing jobs, such as broad analytical skills, strong engineering fundamentals and strong business acumen
- communications technology and software development
- will require higher level and more diverse skills for sustainable electric energy industry positions

Preparing Smart Grid Job Growth

- basic power-system principles as a priority; followed closely by understanding power system operating principles, smart grid applications, communications systems and cybersecurity issues; and understanding renewable generation
- collaboration between industry, governments, and schools

Preparing Smart Grid Job Growth

- electric energy industry efforts to bolster training programs with affiliated educational institutions and within their own companies
- well-rounded education to facilitate the necessary breakdown of functional silos
- the millennial generation, with familiarity in communications technology and affinity for dynamic and creative work environments, will thrive

Preparing Smart Grid Job Growth

- instill excitement in students from an early age about satisfying careers in engineering, especially power engineering and related sciences and technology education platforms essential to the support of smart grid
- training teachers to know more about engineering, and power engineering specifically, makes them more likely to recommend that students pursue engineering as a discipline

Illinois Science and Energy Innovation Foundation (ISEIF)

The Illinois Science and Energy Innovation Foundation (ISEIF) was created to inform and engage Illinois consumers in the transformation to a digital electric grid. ISEIF accomplishes this through funding innovative education, outreach, and research projects in correspondence with smart meter deployment timelines.

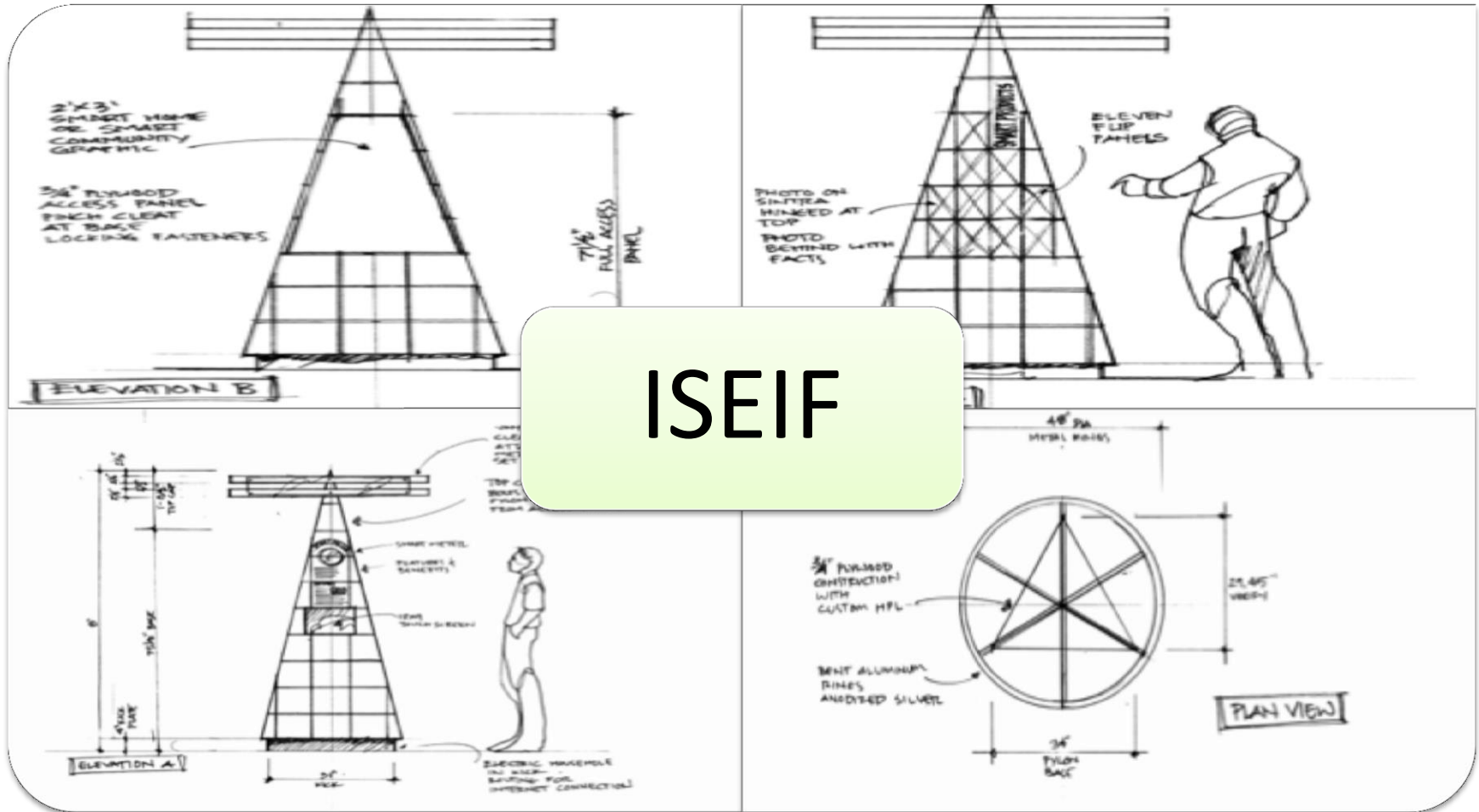


Our mission is to empower consumers to understand and adopt smart grid technologies and related programs; to create positive changes in consumer behavior related to patterns of energy use; and to transform cultural norms regarding the relationship between the consumer, the utility and energy consumption.

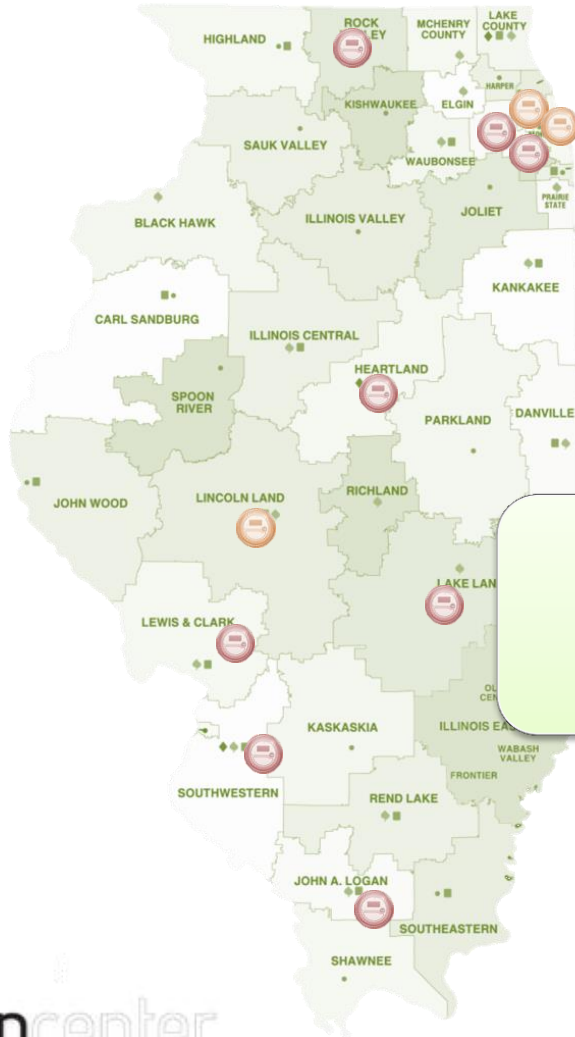
Smart Grid Education

The screenshot displays the ISEIF website interface. At the top, there are four panels with user testimonials: "I'm getting a smart meter", "I want to know more about the smart grid", "I want to save on my electric bill", and "I want to teach". A central blue circle says "TELL US WHY YOU'RE HERE". Below these are "Grid View" and "Home View" buttons. The main content area is split into two sections. The left section features a 3D diagram of a smart grid with a power plant, transmission lines, and smart meters, with a "Drag me!" instruction. The right section is titled "THE ILLINOIS POWER GRID IS GETTING AN UP" and includes a "REAL TIME PRICING" graph, a "JUST MY PLACE" vs "THE WHOLE STATE" selector, and two price boxes: "\$1,517.18" and "10,837". Below this is a section titled "AM I GETTING MY SMART METER?" with a "Who's your electricity provider?" dropdown menu (set to "ComEd") and a "FIND OUT!" button. At the bottom of this section, it says "IGEN & ISEIF are teaming up to educate Illinois power consumers about the smart grid and smart meter." with buttons for "ABOUT US", "OUR PARTNERS", and "CONTACT US". A central white box with the text "ISEIF" is overlaid on the page.

Smart Grid Education



Smart Grid Education Workshops



ISEIF



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Illinois State University Energy Industry Activities

David G. Loomis, Ph.D.

Director, Energy Learning Exchange

Director, Center for Renewable Energy

Executive Director, Institute for Regulatory Policy Studies

Professor, Department of Economics



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Who am I?

- Starting my 19th year as a professor
- Teaching in the Electricity, Natural Gas and Telecommunications Sequence in Applied Economics
- Co-created the renewable energy undergraduate major



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Institute for Regulatory Policy Studies

- Created in 1997, the Institute is housed within the Department of Economics in the College of Arts and Sciences at Illinois State University.
- The Institute serves the regulatory community with education, communication, and research on policy issues of interest to consumers, regulators, and utilities in Illinois and throughout the nation.
- The Institute supports the Master's Degree Program in Applied Economics with a sequence in Electricity, Natural Gas, and Telecommunications Economics.



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Member Institutions



An AGL Resources Company



at&t





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National Database of Utility Rates and Rate Structure

- \$850,000 three-year grant
- Funded 15-20 students each summer for internships
- Funded 4-8 Graduate Assistantships each school year



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Energy and Water Policy Conference

- October 23, 2014
Crowne Plaza Hotel
Springfield, IL
- The conference will focus on three issues concerning (1) innovations in energy efficiency, (2) declining water usage, and (3) innovations in customer service.



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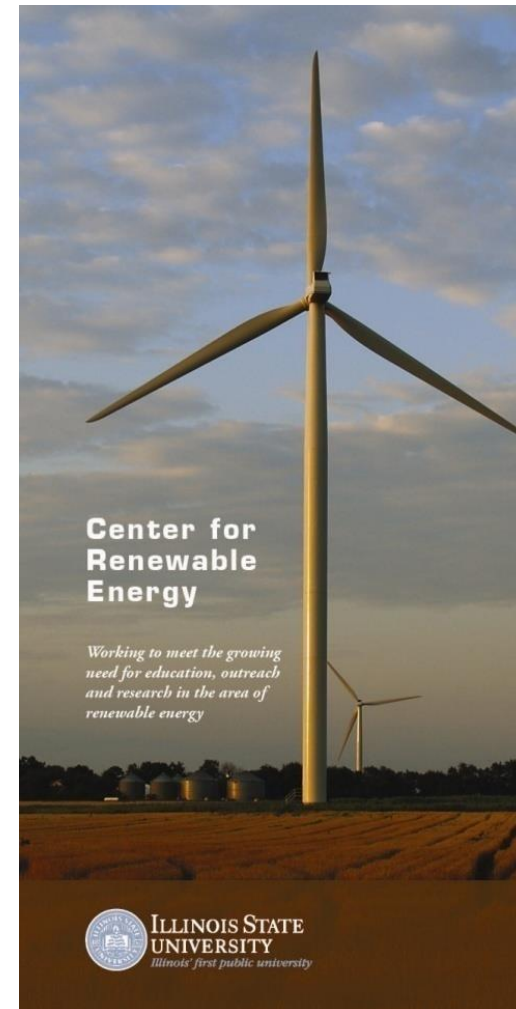
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Purpose

- Supporting the renewable energy major at Illinois State University
- Serving the Illinois renewable energy community by providing information to the public
- Encouraging applied research on renewable energy at Illinois State University and through collaborations with other universities





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Illinois Renewable Energy Conference

- July 16, 2014
- Illinois State University, Normal, IL
Bone Student Center Ballroom





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**ENERGY LEARNING
EXCHANGE**
Illinois State University



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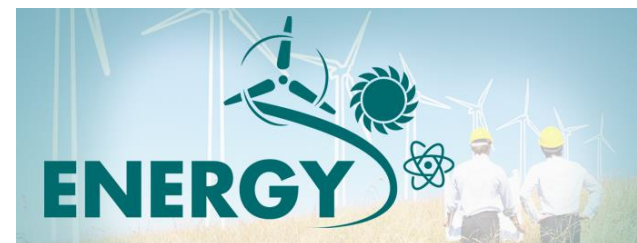


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Energy Learning Exchange

- Part of Illinois Pathways education reform
- Public-Private Partnership to advance STEM learning in P-20 setting emphasizing 7-12 grades
- Run by IRPS, CRE, and CeMAST

ILLINOIS
Pathways
Science, Technology, Engineering & Math





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IL Pathways Initiative

Goal: To create a new, innovative public-private education infrastructure that can advance college and career readiness in STEM discipline by coordinating statewide networks of P-20 education partners, business, labor, and other organizations based on career clusters.

ILLINOIS
Pathways
Science, Technology, Engineering & Math



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P-20 STEM Programs of Study

“P-20 STEM Programs of Study are organized around a career cluster and feature a series of orientation and advanced pathway courses across education institutions that are accompanied by opportunities for students to enrich their learning through work-based learning experiences as well as demonstrate their understanding through assessments and the attaining of early college credit and industry-recognized credentials.”



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What is a Learning Exchange?



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P-20 STEM Program Clusters





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P-20 STEM Program Working Groups

- Public-private working groups developed statewide models for each of the nine P-20 STEM Programs of Study.
- These models establish a series of shared definitions that will support statewide networks and facilitate connections between public-private partners in each of the nine areas.
- Components of the reports include:
 - Career Profiles (Demand)
 - Baseline Analysis (Supply)
 - P-20 Course Sequence and Definition Model (Course Outline)



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STEM Learning Exchanges

“STEM Learning Exchanges are a new, innovative public-private education partnership that is organized to support local implementation of P-20 STEM Programs of Study by coordinating and reducing the transaction cost among statewide networks of education partners, businesses, industry associations, labor organizations, and other organizations. Learning Exchanges are organized by career cluster and work to coordinate planning and investment, aggregate resources, and review talent supply-chain performance.”



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Learning Exchange Functions

- Provide curriculum resources.
- Expand access to classroom and laboratory space, equipment, and related educational resources.
- Support student organizations and their major activities.
- Provide internships and other work-based learning opportunities.
- Sponsor challenges and provide project management resources.
- Provide professional development resources for teachers and school administrators.
- Provide career development and outreach resources.
- Review P-20 Program of Study model and transitions to post-secondary academic and training programs.
- Review talent pipeline performance.



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ILLINOIS Pathways - Energy Cluster

www.illinoisworknet.com/vos_portal/STEM/en/ILPathways/Energy/

Stay Connected: Browsealoud, FAQ, Facebook, LinkedIn, Newsletter, RSS - Events, RSS - News, Twitter, YouTube

Language: English

ILLINOIS Pathways
Science, Technology, Engineering & Math

ABOUT ILLINOIS PATHWAYS GRANTS FAQS NEWS RESOURCES CONTACT

Share, Facebook, Twitter, LinkedIn, YouTube, Facebook

ENERGY

Energy Cluster: Developing, planning and managing the production of energy including renewable energy and clean coal technology and its distribution through smart grid technologies.

Cluster: Change Cluster [Go]

= Courses
 = Work-Based Learning
 = Credentials / Assessments
 = Shared Pathways

Select any Pathway to see related programs then click on any course, work-based learning, credentials/assessments, or shared pathway icon to see related lists.

Energy Pathways	Orientation (e.g. Middle & High School)	Pathways (e.g. High School)	Postsecondary Education and Training Bridge / Certificates and Associates / Bachelors / Graduate	Careers
Energy Management	Technology Orientation <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Energy Management <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Energy Management <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Careers
Energy Engineering		Energy Engineering <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Energy Engineering <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Careers
Building Energy Efficiency		Building Energy Efficiency <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Building Energy Efficiency <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Careers
Transportation Energy Efficiency		Transportation Energy Efficiency <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Transportation Energy Efficiency <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Careers
Energy Research and Development		Energy Research and Development <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Energy Research and Development <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Careers
Energy-Related Manufacturing		Energy-Related Manufacturing <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Energy-Related Manufacturing <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Careers

[Supply and Demand Reports](#)
 Collection of reports highlighting cluster occupation profiles and Illinois school programs and completers

[Search All Courses and Credentials](#)
 Search for a specific course or credential or list of courses/credentials.



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History of the Energy Learning Exchange



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ELE Timeline to Date

- May 14, 2012
Early Planning Meeting
- September 14, 2012
Governor Pat Quinn announces 8 STEM Learning Exchanges at a press conference in Chicago
- October, 2012 – December, 2012
3 Subcommittees formed and meet via conference calls
- January 18, 2013
Full group in-person meeting
- June 30, 2013
Submit Final Report to ISBE on how the ELE will achieve each of the nine functions, areas of strength and weakness, key resources, areas of perceived need, resource gaps, and a description of all private-public partnerships funds to support implementation.



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Who is Part of the Energy Learning Exchange?



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Energy Learning Exchange Members

Colleges and Universities:



**ILLINOIS STATE
UNIVERSITY**
Illinois' first public university



SIU
Southern
Illinois
University
CARBONDALE



**WESTERN
ILLINOIS
UNIVERSITY**



College of Lake County



EASTERN ILLINOIS UNIVERSITY



**NORTHWESTERN
UNIVERSITY**

ISEN

INITIATIVE FOR SUSTAINABILITY
AND ENERGY AT NORTHWESTERN



Kankakee Community College



**JOLIET
JUNIOR COLLEGE**
1901-



**ILLINOIS INSTITUTE
OF TECHNOLOGY**



Illinois Community College Board
www.iccb.org





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Energy Learning Exchange Members

Schools :





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Companies :



Robert M. Fletcher Company

PROactive Strategies, Inc.

Sustainable Strategies

Sustainability Consulting

WES Engineering





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Energy Learning Exchange Members

Workforce Boards:

McHenry County
mchenrycountyil.gov



The Workforce Boards
OF METROPOLITAN CHICAGO

**DuPage
Workforce
Board**
Making Connections

**Workforce Investment Board
of Will County**

RIVER VALLEY
WIB
WORKFORCE INVESTMENT BOARD

Cook County
Illinois

Lake County

galvin center
for electricity innovation
at ILLINOIS INSTITUTE OF TECHNOLOGY

**IEEE
PES**
Power & Energy Society®



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Workforce Related:



Operation Green Jobs



TEAMSTERS LOCAL 786

SEIU Local 73

Representing 25,000 Public Service Employees in Illinois & NW Indiana



Local 18007



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More:



The Illinois
Business RoundTable



Association of Illinois
Electric Cooperatives

ILLINOIS ⚡ ENERGY 🔥 ASSOCIATION



**Illinois
Department of Commerce
& Economic Opportunity**
Pat Quinn, Governor



Bloomington-Normal
ECONOMIC
DEVELOPMENT
COUNCIL



Three Rivers Education for Employment System

IGEN 
Illinois Green Economy Network
A Community College Partnership

 **isea**
illinois solar
energy association




**ILLINOIS CHAMBER
OF COMMERCE**

galvincenter
for electricity innovation
at ILLINOIS INSTITUTE OF TECHNOLOGY


Power & Energy Society®



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National and State Resources

Illinois Energy Workforce Consortium





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Where are We Headed?



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Key Future Milestones

- Program of Study rollout at Urbana High School
 - NGSS Curriculum
 - SmartGrid for Schools; Wind for Schools; Solar for Schools; Biomass/Fuel Cell/Storage
- Careers in Energy Week October, 2014
- Energy Student Competition Challenge
- Internships
- Comprehensive catalog of Energy POS and curriculum



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Illinois State Board of Education Grants

- Planning Grant \$50,000
- (IL DCEO) Implementation Grant \$350,000
- Corporate Donation of \$50,000 from Nicor Gas





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New Energy Curriculum for Illinois (WIP 5)

- Two year \$370,000 grant to do teacher professional development and create new curriculum for Next Generation Science Standards
- Twenty five teachers went on industry field trips and produced curriculum





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Smart Grid for Schools

- One year \$450,000 grant to create curriculum and traveling exhibits
- Teacher Professional Development for 175 teachers





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Renewable Energy for Schools

- Wind for Schools Grant (\$302,570)
- Solar for Schools Grant (\$66,000)
- New Grant (\$130,000)





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THANK YOU!

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Smart Grid in the Classroom

Christopher Miller

Professor

Heartland Community College

Smart Grid in AAS

- Embedded into industrial and electronic programs
- Also run as independent course



Possible Job Outcomes

- Consumer based infrastructure / install
- Some Power Distribution jobs
- Integration into Industry power measuring
- Embedded skills / marketability to traditional technical / electrical maintenance areas
- Possible medical infrastructure

The Smart Grid

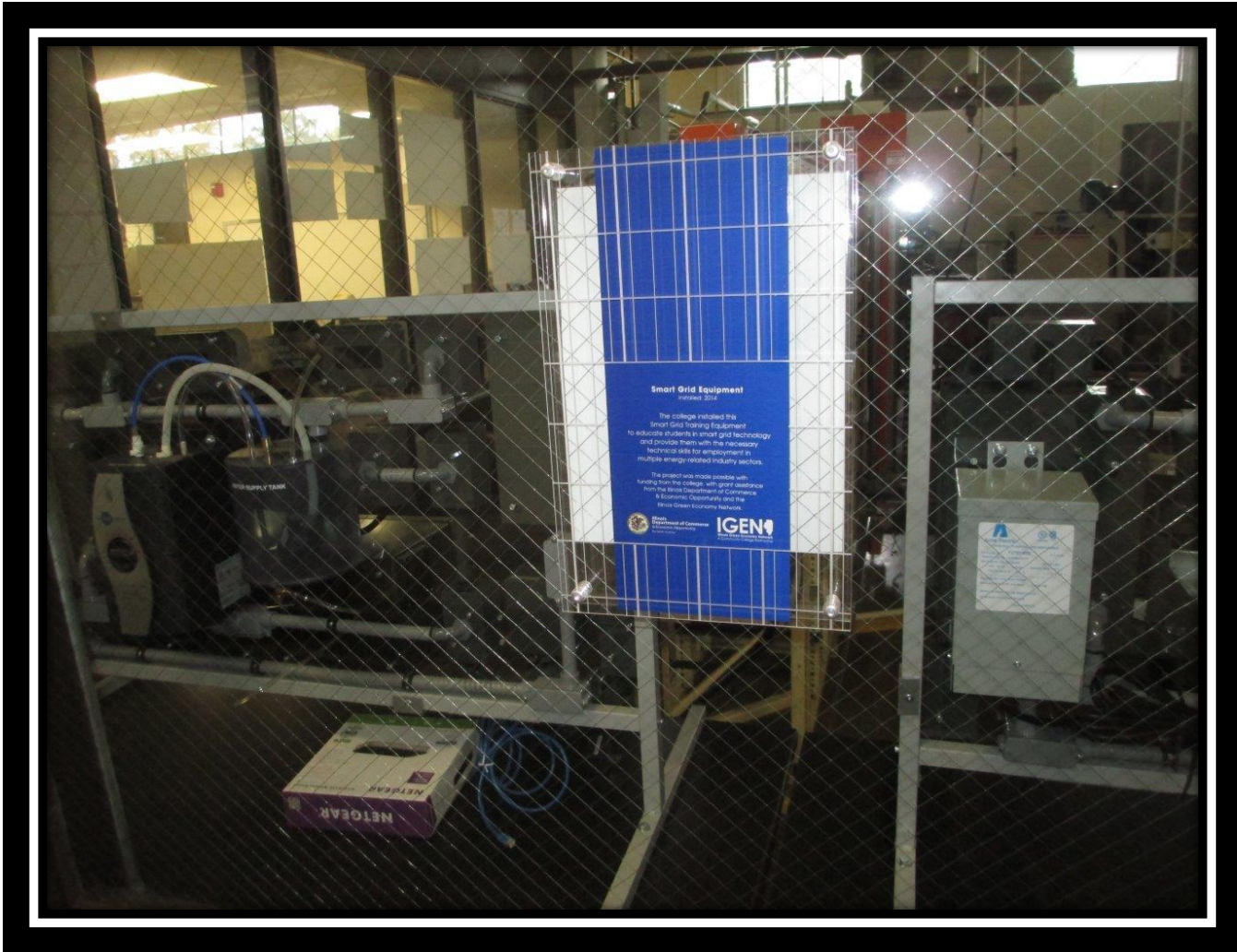
Bob Clark

HVACR and Facilities

College of DuPage

The Smart Grid Initiatives

- College of DuPage will work with the local utility representatives.
- The College will offer help to the local communities about Smart Grid interests.
- A credit class will be offered in Spring of 2015.
- Smart Grid Trainers/Equipment are set up and fully functional in a classroom at the college.



The Smart Grid Fundamentals

Spring 2015 Class

- Course Objectives:
 - Describe power grid system operation
 - Identify and perform repairs on converters
 - Recognize and perform repairs on smart grid devices
 - Analyze and prepare maintenance procedures for wind and solar smart grid equipment
 - Set up and develop a maintenance plan for home energy systems
 - Outline smart grid system options
 - Define fault analysis in power grids
 - Arrange microgrid and power grid system maintenance methods

Further Explorations

- Students will integrate the smart grid meter into existing lab electrical systems.
- Students will integrate the smart meters into our lab building automation system.
- Lab energy use will be data logged and quantified.
- Advanced Smart Grid curriculum will be explored.

Questions?

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