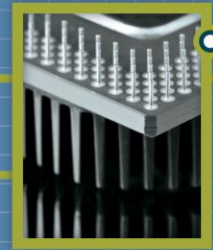
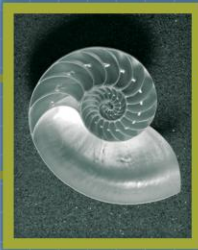


GridWise[®] Architecture Council

Electrical Power Engineering Academic Landscape

November 2011



GRIDWISE[®]

Electrical Power Engineering Academic Landscape

November 2011

Prepared for
The GridWise® Architecture Council by Weldon Consulting, LLC

In support of the GridWise Architecture Council's
University Outreach Initiative
PNNL-21117



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Introduction

University Outreach Initiative Overview

The GridWise® Architecture Council (GWAC) is a team of experts with diverse and relevant industry backgrounds who have documented the guiding principles for the architecture and interoperability of a future intelligent, transactive energy system.

One of GWAC's goals includes sharing information about their work broadly with industry and other communities that have a need to understand smart grid architecture and interoperability. The concept of the University Outreach Initiative was developed in the spring of 2011 as a set of market research and outreach activities. These activities were developed to identify opportunities for the dissemination of information about the GWAC to academic and workforce development communities. Grant recipients of the Smart Grid Workforce Training Program, funded through the American Recovery and Reinvestment Act (ARRA), were identified as initial outreach recipients. Outreach contacts in this community of grant recipients consist of academic and workforce program managers involved in the development of electrical power engineering—or other closely related smart grid technology and business programs—at two- and four-year institutions, as well as private sector curriculum development companies, and governmental or collaborative workforce development agencies.

The Outreach Initiative started with the development of the Landscape Database and Contact Directory. These documents provide descriptive project and contact information for the *Smart Grid Workforce Training Program* recipients. Contact information was gathered through telephone calls and Internet research. Contacts identified by telephone were introduced to the project in conversation and were asked whether they wished to participate. Their knowledge of GWAC was assessed. Contacts we could not reach by phone received introductory emails explaining the Outreach Initiative and providing links to important GWAC documents for background. A survey to identify contact interest in the initiative was circulated to all contacts several weeks later.

University Outreach Initiative Deliverables

Initiative deliverables consist of a summary report and four appendices described below.

Summary Report Contents

1. Academic Landscape: Describes the current academic and workforce environment relative to electrical power engineering and related workforce development efforts. This background is offered to provide context for the Outreach Initiative. Observations based on research and conversations with contacts are provided.
2. University Outreach Initiative Opportunities: Identifies two complementary opportunities to consider in furthering the Outreach Initiative.
3. Survey Results Summary: This report section reviews survey results.
4. Potential Alliances: Highlights six organizations that may be helpful in promoting the GWAC University Outreach Initiative.
5. Four appendices are provided in a separate Excel document (best read on screen).

Appendix 1, ARRA Landscape Database: The Landscape Database¹ includes a detailed overview of each ARRA Grant Recipient. The detailed overview consists of four fields: Institution name, Program Title, Program Mission, and website address (URL). The Program Mission field includes data gathered directly from a U.S. database, Recovery.gov, providing grant narrative text and publicly available quarterly report updates (where available).² Quarterly report summaries provide rich information on recipient partners, curriculum development efforts, project status, and scope. Notes from telephone calls are included in a number of cases.

Appendix 2, Contact Directory: The Contact Directory³ includes the following data fields: Institution Name, Program Title, Website Address, and Lead Faculty Contact information including email address, phone number, and mailing address (where available).

Appendix 3, Minnesota Consortium: The University of Minnesota is a recipient of the Workforce Training ARRA-funded grant. They have developed a consortium of universities who have agreed to share new lab-related curriculum.⁴

Appendix 4, Survey Results: Complete survey results are provided on sheet 3.⁵

¹ Filename: 11.22.11 Outreach Database, sheet title: A-1, AARA Landscape Database.

² Recovery.gov. Web. 12 Aug. 2011. <<http://www.recovery.gov>>.

³ Filename: 11.22.11 Outreach Database, sheet title: A-2, Contact Directory.

⁴ Filename: 11.22.11 Outreach Database, sheet title: A-3, Minnesota Consortium.

⁵ Filename: 11.22.11 Outreach Database, sheet title: A-4, Survey Results.

Academic Landscape

Overview of U.S. Electrical Power Engineering Workforce and Academia

U.S. education and workforce efforts are at a critical point in time. Universities cannot prepare enough engineers, and two-year community colleges are swelling under the pressure of industry workforce needs. The following points provide background on the current status of the sectors discussed in this report.

The IEEE Power & Engineering Society's Workforce Collaborative explains in a 2009 report, "*Preparing the U.S. Foundation for Future Electric Energy Systems*," the following:⁶

- 45% of all engineers in the electric utility industry become eligible for retirement in the next five years.
- Over 7,000 power engineers are required to replace them.
- It could take three times that number of electrical power engineers to actually satisfy the entire economy's needs.
- There are between 800 and 1000 graduates in power engineering each year, but it is hard to say whether graduates enter the utility market.
- Additionally, 40% of key power engineering faculty could retire in the next five years.

Most university electric power engineering programs have been underfunded over the past three decades due to emphasis elsewhere in the engineering discipline. With only 170 engineering faculty working full-time in U.S. power engineering education and research today, institutions around the country face stiff competition for the qualified faculty.

Electric power engineering research dollars from the National Science Foundation (NSF), Electric Power Research Institute (EPRI), and industry funding streams plummeted over the last 15 years due to a range of market forces and shifts in institutional focus. Estimates of 2007 funding fell to \$50 million per year.⁷

In decades past, engineering university programs and utility companies shared a stronger relationship, leading to sponsorships, scholarships, and mobility for graduates and faculty alike. Market forces, combined with a de-emphasis on electric power engineering at universities, have changed the relationship, which resulted in a workforce gap at a time when our country faces a dire need for more qualified engineers. Many new programs in power engineering are emerging to meeting the growing workforce demand. The ARRA-funded programs researched in this study represent only a few.

The Workforce Collaborative 2009 report identified that there were fewer than 5 'very strong' university power engineering programs in the U.S. They refer to the following metrics in identifying the strength of a program:⁸

- four or more full-time power engineering faculty
- adequate research funding for each faculty member to support acceptable numbers of graduate students
- broad undergraduate/graduate course offerings
- sizable student enrollments

⁶ Preparing the U.S. Foundation for Future Electric Energy Systems: A Strong Power and Energy Engineering Workforce. Management Steering Committee of the U.S. Power and Energy Engineering Workforce Collaborative, Apr. 2009. Web. 18 Oct. 2011. <http://www.ieee-pes.org/images/pdf/US_Power_&_Energy_Collaborative_Action_Plan_April_2009_Adobe72.pdf>.

⁷ Russell, Don B. "Educating the Workforce for the Modern Electric Power System University-Industry Collaboration." *The Bridge* 1st ser. 40 (2010): 47-52. Web. <<http://www.nae.edu/Publications/Bridge/TheElectricityGrid/18873.aspx>>.

⁸ Ibid., p. 5.

Industry growth in response to global energy concerns combined with renewed interest in U.S. competitive status in fields of science and engineering have put the spotlight on a national need to fund science education in general. The ARRA *Smart Grid Workforce Training Program* represents one important stream of federal dollars toward that cause.

Four-Year Research Institutions: Outreach Research Summary

Research-oriented grant recipients of the *Smart Grid Workforce Training Program* are using federal funds to bolster and reorient their existing programs toward the growth potential found in the need for modernization of the U.S. electrical grid. Students will graduate with a variety of undergraduate and graduate degrees in engineering, network, systems and architectural design, and management. New focus and marketing efforts will hopefully bring further industry sponsorship and research dollars to both traditional departments and newly created smart grid centers offering interdisciplinary opportunities.

Enrollments in online professional certificate programs at four-year institutions are growing. Online course delivery provides opportunities for institutions to offer specialized certification programs in a host of new smart grid technologies. These programs showcase their new emphasis in grid modernization and extend enrollment beyond the traditional college audience to alumni and adult learners seeking professional development opportunities. Staffing online programs with qualified faculty will probably be a challenge given demand for industry consultants who often fill such positions.

Professional certification programs at universities launched from inside or outside of traditional academic departments will develop new and lucrative revenue streams serving both traditional students and professional markets. Many ARRA-funded two- and four-year institutions are teaming with workforce agencies to serve the educational needs of local industry.

Observations from research and discussion with four-year research faculty:

1. Contacts were interested in gaining access to GWAC materials and thought it was worth reviewing the material. Interest in attending a GWAC faculty webinar was strong.
2. Telephone interviews suggest a low level of exposure to the GridWise Architecture Council's role and its work. In a few cases the Council was confused with the GridWise Alliance.
 - It is unclear whether complex concepts of technical and business interoperability, strategic systems architecture, and the application of standards toward creation of a truly intelligent and interactive grid will be taught evenly across the U.S. if faculty is not generally well informed by the GWAC materials.
3. Interdisciplinary programs appear well positioned to provide the best environment for teaching the complex business and technical interdependencies inherent in grid modernization. Several faculty contacts voiced concern that traditional institutional barriers such as tenure track, research requirements, and departmental politics will present obstacles for many who attempt to build interdisciplinary models. This topic is beyond the scope of this outreach project but is important to note.
 - There may be opportunity to introduce an accreditation process that recognizes institutions that execute on some set of federally recognized best practices.

4. Mechanisms providing collaboration and communication between energy-related programs at two-year and four-year institutions are critical to the development of transfer and articulation agreements.⁹

Workforce Development and Stackable Certificates: Outreach Research Summary

A number of universities, workforce-development agencies and private sector providers of electrical power systems educational resources are teaming with employers to address the need for qualified employees through the delivery of “stackable certificates.” Stackable certificates offer students the opportunity to gain foundational skills that can be followed by successively focused modules that create a “stack” or collection of modules. Such certificates are helpful for students entering the energy utility market and for utility employees seeking upward career mobility.

These certificate programs will train employees to fill technical gaps in the workforce based on market needs. Most ARRA-funded projects in this workforce category will serve technicians, plant operators, pipefitters and -layers, and line workers. Many mention providing education for engineers as well.

Strategic workforce development organizations want to make sure that modules within a stack are transferable across educational programs within a region as students often move or change employment. This is a challenging objective.

Utilities are teaming with two-year institutions across the country and seem to believe that two-year degrees and certificate programs will meet much of industry’s workforce need, especially when combined with internal professional mentoring and development. Two-year programs will increasingly offer some combination of entry-level skills-based curriculum for utility workers’ specialized certificate programs, and preparation in math, science and engineering for those pursuing four-year degrees. Community colleges and other private providers of targeted technical and professional skills are important audiences for receipt of GWAC curriculum materials.

Observations from research and discussion with faculty associated with two-year institutions and workforce development staff:

1. Based on telephone conversations and review of curriculum (where available) there is a need for authoritative sources of information on strategic U.S. initiatives and resources from organizations like GWAC at two-year institutions.
2. No contacts at two-year institutions or private curriculum companies reached during this outreach project were familiar with the GWAC. Contacts were, however, grateful to hear of the outreach initiative and indicated a strong interest in learning more about the Council and the opportunity to receive freely available course material. Interest in receiving material on U.S. infrastructure strategy was high, and several contacts sounded relieved to hear that curriculum materials would be available on this topic. Most contacts sounded eager to identify ways to use the curriculum materials as they construct their new programs. Staffing new programs and identifying worthy curriculum materials was often noted as a time-consuming and daunting task.
3. National and regional workforce organizations are working to provide guidance on development of entry level standards for energy education and means of providing upward mobility for entry level and advancing professionals through two-year

⁹ Articulation committees at four-year schools design agreements with their feeder community colleges regarding which credits will be accepted toward the total number of credits required for specific degree programs.

- institutions.¹⁰ The task is formidable. Their efforts would benefit from further federal collaboration and support for such initiatives.
4. Several workforce development organizations suggested in discussion that there is a role for the Department of Energy, or national laboratories, in collaborating with workforce development and academia in identifying high-level educational standards in the field. National standards could make it easier to develop regional articulation agreements between two- and four-year institutions.
 - The development of new energy programs across the country presents an outstanding opportunity for articulation committees to identify the most productive and efficient path to higher education for all students within a region, and perhaps across the country. Several regional ARRA-funded projects aim to assure transferability; however there are only a few such strategically focused projects.
 - The report, *Task Force on America's Future Jobs: Executive Summary and Policy Recommendations*, written by the Bipartisan Policy Center in collaboration with prominent professionals in workforce development, presents a rich and compelling outline of policy recommendations. Recommendation #3 in the policy document calls for development of a repository that would identify training standards and best practices for energy-sector jobs. This repository would serve multiple purposes for employers and curriculum developers as they seek to map their requirements against an established and agreed-upon set of standards. The Department of Energy working with the Departments of Labor and Education may need to establish a framework for execution of such policies.

¹⁰ Tatsutani, Marika. *Task Force on America's Future Energy Jobs: Executive Summary and Policy Recommendations*. Rep. Bipartisan Policy Center, June 2011. Web. <<http://www.bipartisanpolicy.org/library/report/task-force-americas-future-energy-jobs-executive-summary-and-policy-recommendations>>.

GWAC University Outreach Initiative Opportunities

It is rare that an entire industry is reborn with the vigor and urgency seen in the electric power sector. There is an equally rare opportunity to contribute to the electrical power engineering curriculum at both the university and professional development level—infusing it with the foundations and principles essential to the development of an intelligent and transactive energy system.

Two primary opportunities emerged from the research project. They are not mutually exclusive but are, in fact, complementary.

Opportunity #1: Develop Faculty Webinar Introducing GWAC and offer Curriculum Materials

1. Create a 60-minute GWAC PowerPoint webinar designed to introduce the Council's purpose, concepts, principles, and key documents for faculty and energy workforce curriculum developers.
 - Provide case studies and reading materials that provide concrete examples of implications to research and teaching.
2. Market the GWAC faculty webinar to the Outreach Contact Database.
3. Develop strategic relationships with key curriculum developers for broader distribution.
4. Collect feedback from webinar attendees for curriculum module development efforts.

The webinar will serve to expose faculty and workforce curriculum developers to GWAC concepts and will further inform development of curriculum materials. Telephone and email outreach to contacts indicated overwhelming interest in the webinar. Survey responses also reflect this interest.

Creating and marketing this material through strategic partner channels and assertive GWAC marketing campaigns is essential to building awareness regarding the GridWise Architecture Council. Building awareness, however, will take time. Research suggests there is a high potential for limited webinar attendance until there is significant and broad understanding of the value of GWAC influence in U.S. infrastructure development.

Initial webinar attendance of 20 to 30 can be assumed based on survey results and interviews. Quarterly introductory webinars and regional promotion should be considered. The webinar content will become useful material for various GWAC Bootcamp presentations. Aggressive marketing of the webinar could drive a higher attendance.

Opportunity #2: Identify Alignment and Interest in Federal Coordination of Energy Education

1. Recommend the Department of Energy explore aligning the efforts of key smart grid initiatives (such as GWAC, SGIP, NIST, and possibly others) to provide strategic and tactical guidance to electric power grid modernization academic and workforce development programs.
 - Coordinate a summit of leading academic and workforce thinkers to discuss the need for a strategic national framework of standards for energy education at academic, workforce and consumer levels.

- Identify potential roles that federal agencies, national labs, and organizations like GWAC could play in developing and maintaining a framework for sharing curriculum materials.
- Provide clear guidance on authoritative curriculum topics of strategic importance.
- Standards in energy education and the possible usefulness of an open courseware curriculum framework are valuable topics worth exploring. A host of open-course learning initiatives illustrate that a new model of open course delivery may facilitate a more democratic and available education.¹¹

Not all programs reviewed in this project have a need for detailed technical information on GWAC. However, the multidisciplinary nature of GWAC material makes basic exposure to its concepts valuable to a wide range of engineering and smart grid technology programs. In the cases of outreach contacts who were unfamiliar with GWAC, it is unclear how their program's curriculum addresses issues associated with interoperability, architecture, and the application of technical standards in the development of a transactive and intelligent grid. If GWAC's vision and NIST standards efforts are to drive the national infrastructure, then there needs to be clear alignment among the vision, the standards, and curriculum.

Curriculum development on a topic such as the development of a modernized electrical energy infrastructure will be uneven and may lack coherent strategic influence unless guided at a national level to some extent.

Conclusion

A GWAC University Outreach Initiative to the academic and workforce development communities will require some degree of relationship development and maintenance. Introducing GWAC to these communities through faculty webinars and course materials is one step for the Initiative.

Helping the target audiences understand the nexus between faculty or workforce development agendas and the context and influence of the GridWise Architecture Council is another step. This second step may require a coordinated federal effort to help frame a discussion with stakeholders regarding curriculum development from a strategic perspective.

¹¹ Examples include MIT's OpenCourseWare project, Stanford's Engineering Everywhere, and Carnegie Mellon's Open Learning Initiative.

Survey Results Summary

A summary of survey results is provided in this section of the report along with relevant graphs. A demographic summary is followed by a summary of academic interests and interest in GWAC materials. Individual survey results are included in Appendix 4.

Demographics

1. Respondents, Table 1
 - A total of 22 surveys were returned from a total of 151 contacts.
 - 13% of survey responses came from ARRA-funded contacts.
 - 23% of survey responses came from either Power Systems Energy Research Center (PSERC) members, contacts provided by GWAC members, or friends.
 - 15% of all survey recipients responded.
2. Level of coursework offered, Graph A
 - A mix of bachelor's, master's, doctoral, workforce development and professional certificate programs are represented. No two-year associate programs were represented.
3. Number of students in program, Graph B
 - 75% of programs represented serve 51 to over 200 students.
4. How program is offered, Graph C
 - 55% of all courses are taught in a mix of in-class and online. A higher response rate from the two-year institutions and workforce development would have tipped the numbers even farther toward online.

Analysis: Initial phone interviews suggested that the survey would be completed by a higher number of ARRA recipients, perhaps up to 30%. Typical survey response for “members and customers” ranged between 5 and 40%, depending on loyalty to an organization or product and an understanding of what’s in it for the survey taker.¹² Because contacts indicated a low level of GWAC awareness by phone, it is probable that a lack of loyalty (or connection) to GWAC resulted in lower than anticipated participation. Overall the return rate is pretty good.

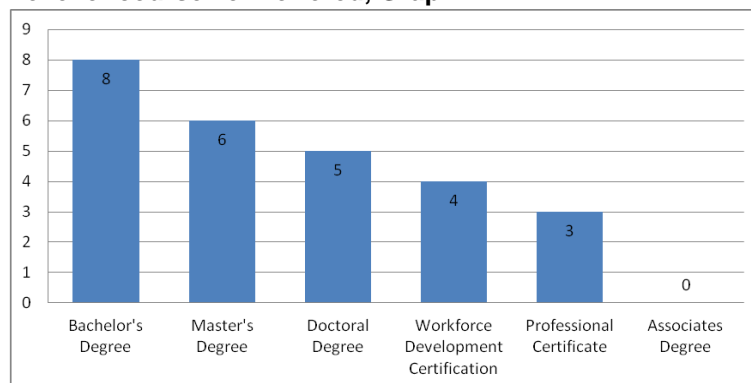
¹² Ray, Ann. "Typical Response Rates." Typical Response Rates and Practical Surveys. Query Group, 20 Mar. 2006. Web. 20 Nov. 2011. <<http://www.practicalsurveys.com/respondents/typicalresponserates.php>>.

Respondents, Table 1

	ARRA-related	PSERC & friends	Total
Surveys sent	134	17	151
Responses	18	4	22
Response Rate	13%	23%	15%

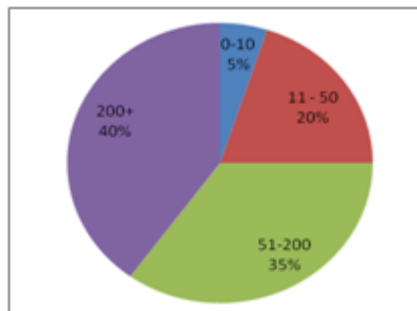
In some cases, multiple contacts at an institution received a survey, however in all cases only one response was received from an institution.

Level of coursework offered, Graph A

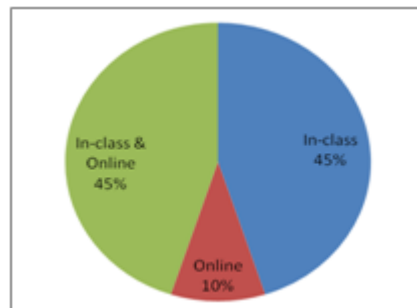


More than one degree was selected by some.

Number of students in program, Graph B



How program is offered, Graph C



Survey Results Summary

Curriculum and Interests

1. Curriculum Emphasis, Graph D

- 22 contacts identified Electrical Engineering as a program emphasis.
- 17 contacts identified Research and Development as a program emphasis.
- 15 contacts identified Information and Communications Technology as an emphasis.
- 8 contacts identified Energy Industry Business courses to be of emphasis.
- 8 contacts indicated their program was multidisciplinary in nature.

2. GWAC Subject Areas of Interest, Graph E

Contacts indicated interest across all area of GWAC expertise.

- 18 contacts selected Energy Generation, Transmission, Distribution – distribution automation, reliability, distributed resources and electricity storage.
- 14 selected Smart Grid Interoperability Roadmap – architecture, domains, interfaces.
- 12 selected Residential, Commercial, Buildings – gateways, energy management, demand response.
- 11 selected Information Technology, Telecom – design, implementation and security.
- 10 selected Market Training, Economics Regulatory – stakeholders, privacy, transactive control strategies.
- 8 selected Industrial Systems and Control – process control, industrial energy management.

3. Usefulness for Interoperability Context-Setting Framework, Graph F

Survey recipients were provided with a link to the document and asked whether the concepts found in the document would be useful to their program's curriculum.

- 9 contacts indicated that the Interoperability Context-Setting Framework is useful.
- 12 contacts indicated that the Framework may be useful.
- 1 contact indicated the Framework is not useful.

4. Usefulness of Decision-Makers Interoperability Checklist, Graph G

Survey recipients were provided with a link to the document and asked if the concepts found in the document would be useful to their program's curriculum.

- 6 contacts indicated that the Interoperability Context-Setting Framework is useful.
- 12 contacts indicated that the Framework may be useful.
- 4 contacts indicated the Framework is not useful.

5. Interest in GWAC Webinar and Quarterly Email Activity Notices, Graph H

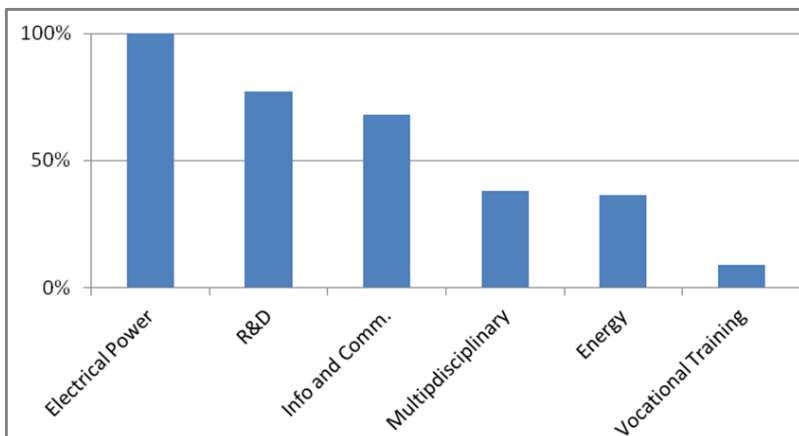
- 85% of contacts are interested in attending a webinar designed to inform faculty on the purpose, mission, and work of the GridWise Architecture Council.
- 77% are interested in receiving quarterly email updates on the GWAC.

6. Formats of GWAC Materials for use in Curriculum Development, Graph I

- PowerPoint presentations, case studies and reading materials are a preferential delivery for GWAC to consider in developing curriculum materials for faculty use.

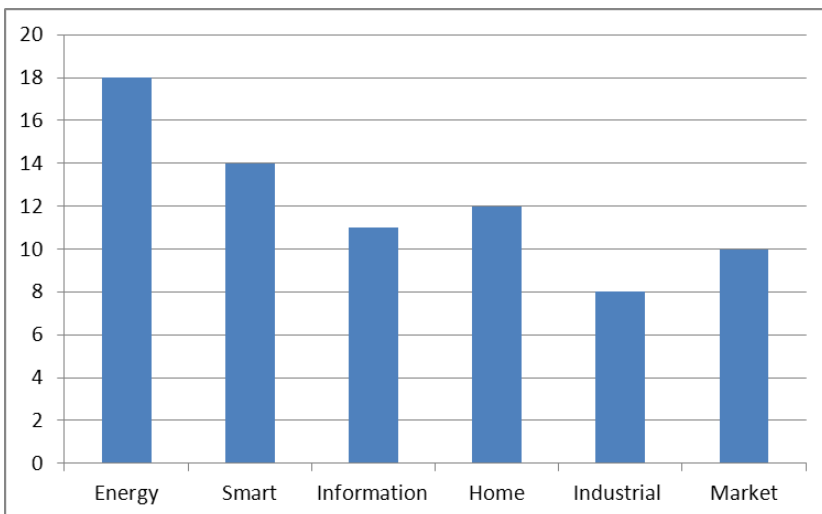
Analysis: Survey respondents indicated an interest in learning more about GWAC through a faculty-focused webinar and show a solid interest in GWAC areas of expertise. Review of the Framework and Checklist required that contacts do some extended reading via an online survey demonstrating a high degree of "loyalty." Their opinions were favorable.

Curriculum Emphasis, Graph D.



“Energy” represents an emphasis in Energy Business.

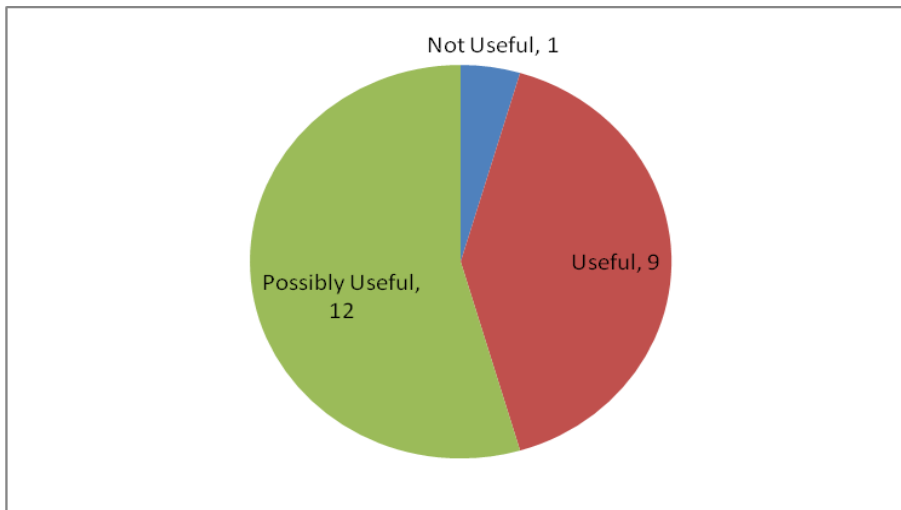
Subject areas of interest, Graph E.



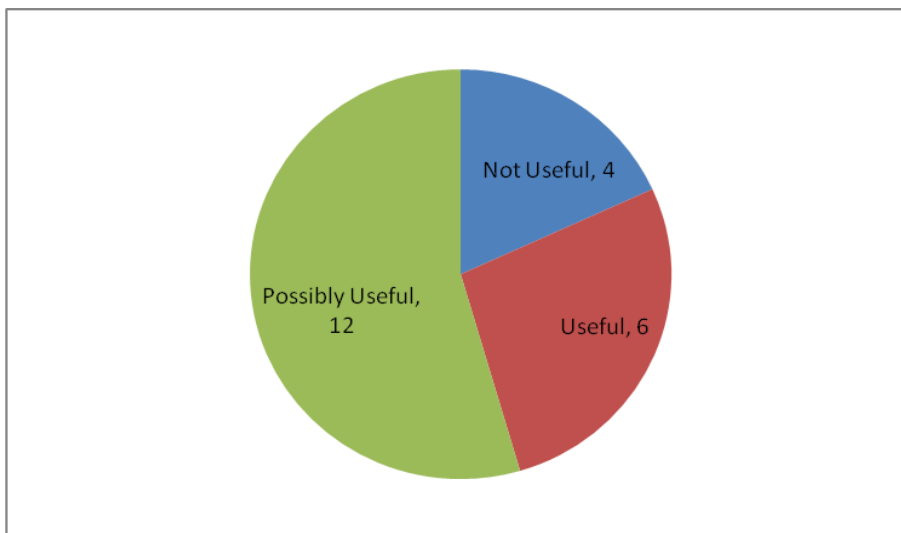
The following categories of Council expertise were listed for selection.

1. **Information** technology, telecom: design, implementation security
2. **Home** Residential Commercial, Buildings: gateways, energy management, demand response
3. **Energy**/Electric Generation, Transmission, Distribution - distribution automation, reliability, distributed resources and electricity storage
4. **Market** training, economics, regulatory: stakeholders, privacy, transactive control strategies
5. **Industrial** systems and control: process control, industrial energy management
6. **Smart** grid interoperability roadmap, architecture, domains, interfaces

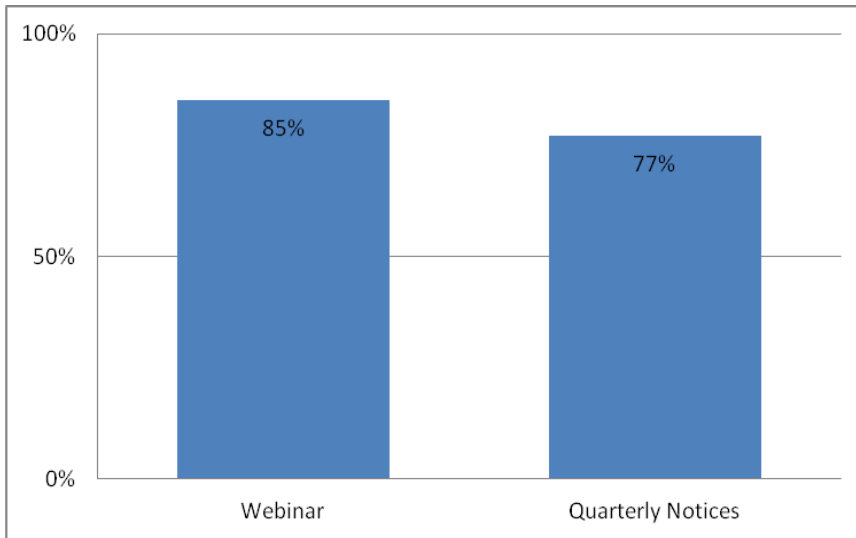
Usefulness of Interoperability Context-Setting Framework, Graph F



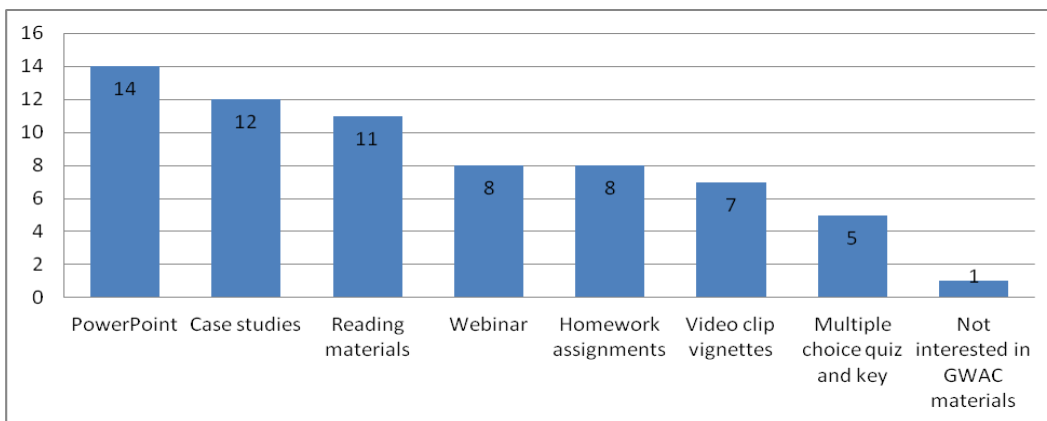
Usefulness of Decision-Makers' Interoperability Checklist, Graph G



Interest in GWAC Webinar and Quarterly Email Activity Notices, Graph H



Formats of GWAC Materials for use in Curriculum Development, Graph I



Potential Alliances for Promotion of GWAC University Outreach Initiative

Six organizations are described on the following pages because they may offer unique opportunities for distribution of GWAC webinar announcements and curriculum materials. These organizations, along with many other ARRA-funded projects, would also be ideal to contact if the Department of Energy were to consider hosting a summit for discussion of how federal agencies could be of more support to academic and workforce projects. This list is not exhaustive by any means and does not represent the full list of stakeholders that should be considered for such further discussions.

Membership, or other alignment with these organizations, may be required for participation in their curriculum development committees. Such an investment could be necessary in supporting the integration of GWAC materials into their curriculum.

The six are:

1. Center for Energy Workforce Development (CEWD)
2. Florida Energy Workforce Consortium (FEWC)
3. IEEE Power and Energy Society (IEEE PES)
4. Office of Naval Research (ONR)
5. Power Systems Engineering Research Center (PSERC)
6. Galvin Center's Smart Grid Education and Workforce Training Center

Unfortunately, few representatives of these potential partners responded to the Outreach survey (PSERC circulated the survey to its members and three responded). Other potential partners include the Energy Providers Coalition for Education (EPCE). An anonymous survey response was provided by this organization, however the respondent indicated no interest in attending the webinar or receiving updates from GWAC. This is unfortunate given that the mission of EPCE is to enhance the quality of online education for associate and bachelor's degrees related to electric grid modernization. EPCE represents over 2/3 of the utility industry and would be a valuable partner in the distribution of GWAC and related and federally sponsored materials.

Of the above mentioned organizations, IEEE Power and Energy Society appears to be the most strategic for GWAC to work with in furthering the University Outreach Initiative. IEEE PES signed an agreement with the GridWise Alliance in 2010 to collaborate on a range of projects. "We look forward to collaborating on education and workforce development, because we feel strongly that a prepared workforce with appropriate competencies is one of the most critical elements for smart grid success," said Wanda Reder, IEEE PES, and Chair, IEEE Smart Grid, in her release at the IEEE PES Transmission & Distribution Conference and Exposition in New Orleans, LA.¹³

¹³"GridWise Alliance, IEEE PES Enter into Agreement." Smart Meters. Voove™ Limited, 22 Apr. 2010. Web. 12 Oct. 2011. <<http://www.smartmeters.com/the-news/935-gridwise-alliance-ieee-pes-enter-into-agreement.html>>.

CENTER FOR ENERGY WORKFORCE DEVELOPMENT (CEWD)

PROGRAM TITLE: Center for Energy Workforce Development (CEWD)

URL: www.cewd.org

MAIN CONTACT: Bob Powers, Chair CEWD
701 Pennsylvania Ave, NW
Washington, DC 20004
202-638-5802

PROJECT CONTACT: Valerie Taylor valerie@cewd.org, Ann Randazzo ann@cewd.org

MISSION: Build the alliances, processes, and tools to develop tomorrow's energy workforce.

DESCRIPTION

The Center for Energy Workforce Development (CEWD) is a nonprofit consortium of electric, natural gas, and nuclear utilities and their associations. Formed in 2006, it includes members such as the Edison Electric Institute, American Gas Association, Nuclear Energy Institute, and National Rural Electric Cooperative Association. CEWD was formed to help utilities work together to develop solutions to the coming workforce shortage in the utility industry. It is the first partnership between utilities, their associations, contractors and unions to focus on the need to build a skilled workforce pipeline that will meet future industry needs.

PARTNERS AND ALLIANCES

Association for Career and Technical Education, Council for Adult and Experiential Learning, Energy Providers Coalition for Education, International Brotherhood of Electrical Workers, Utility Workers Union of America, Helmets to Hardhats, National Association of Workforce Boards

CONFERENCES/EVENTS/RESOURCES

The 2011 CEWD Summit was held November 7-9, in Alexandria, VA. The conference is dedicated to building new workforce skills credentialing systems, curriculum, core course requirements and certificate programs. No 2012 schedule is available yet.

OUTREACH POTENTIAL

1. To become a member of CEWD, GWAC needs to be sponsored by a member utility company. Once sponsored, GWAC could potentially participate on advisory boards or the Education Council.

FLORIDA ENERGY WORKFORCE CONSORTIUM (FEWC)

PROGRAM TITLE: FEWC, partner in the Gateway to Power (G2P): Development of Innovative Strategic Electric Power, Renewable Energy, and Smart Grid Workforce Training (lead institution is Florida Power & Light Company)

URL: www.fewc.org

MAIN CONTACT: Jennifer Grove
Gulf Power Company
jlgrove@southernco.com
850-444-6821

MISSION: Work to impact education policy and support implementation of energy industry-relevant education and training at secondary and post-secondary levels.

DESCRIPTION

FEWC was organized by the Governor of Florida's workforce investment board (Workforce Florida, Inc.) to represent state economic development, workforce development, education, labor, major electric utilities and trade associations.

STRATEGIC GOALS

FEWC is focused on establishing educational competencies for the energy industry. Together with CEWD, they created the "Framework of Competencies for the Energy Generation, Transmission and Distribution Industry."¹⁴ This framework is applicable to occupations of: line installers, electricians, engineering technicians, instrumentation & control technicians, power plant operators.

Their 2012 goal is to further collaborations that will extend the framework's use across post-secondary education and professional certification.

CONFERENCES AND EVENTS

A 2012 schedule is not yet available.

OUTREACH POTENTIAL

1. FEWC is committed to influencing national policy regarding education of energy industry workers. Jennifer Grove is a great contact for securing further alignment with CEWD.
2. Jennifer has offered to review the survey and will distribute the survey to all members of the FEWC.
3. Ms. Grove supports GWAC involvement in the curriculum development effort and would like to collaborate.

¹⁴ "Energy Industry Competency Model." Energy Industry Competency Model. Center for Energy Workforce Development. Web. 8 Aug. 2011.
<<http://www.cewd.org/documents/National%20Forum/Energy%20Competency%20Model%20and%20EEI%20Test%20Overlap.pdf>>.

IEEE POWER & ENERGY SOCIETY (IEEE PES)

PROGRAM TITLE: IEEE PES Workforce Collaborative

URL: <http://www.ieee-pes.org/workforce/workforce-collaborative>

MAIN CONTACT: Gregory Reed, Co-Chair Education Working Group; Swanson School of Engineering, University of Pittsburgh
Reed5@pitt.edu
412-383-9862

Peter Sauer, Co-Chair Education Working Group; Site Director, Power Systems Engineering Research Center, University of Illinois
psauer@illinois.edu
217-333-0394

MISSION

Make the higher education experience relevant, stimulating, and effective in creating high quality and professional power and energy engineers.

DESCRIPTION

The Workforce Collaborative is a partnership of industry, government and universities working together to address electric power industry workforce challenges. In 2009, the Collaborative published its action plan for stakeholders in the U.S. economy.¹⁵ The Collaborative aims for positive transformation of relationships among industry, government and universities to support ongoing activities that expand the pipeline of students while building university power engineering programs.

Among the Collaborative's ambitious goals is to create five University Centers of Excellence. These centers will exemplify student outcomes required for 21st century electric power engineering workforce requirements. The Collaborative works closely with the Center for Energy Workforce Development.

CONFERENCES/EVENTS

Future meetings and Call for Papers

- 2012 Transmission & Distribution Conf. & Exposition, 7-10 May 2012, Orlando, FL, USA.
- IEEE Energy Conversion Congress and Exposition, Sept. 15-20, 2012, Raleigh, NC.
- Innovative Smart Grid Technologies, January 16-18, 2012, Washington D.C., USA.
- IEEE Power & Energy Society, Transmission and Distribution Conference and Exposition, May 7-10, 2012, Orlando, Florida.

OUTREACH POTENTIAL

1. Dr. Reed completed a GWAC survey and is interested in receiving further information.
2. IEEE PES launched a strategic relationship with the GridWise Alliance regarding electric power engineering education initiatives in 2010; however, little is printed on the outcome of their relationship.

¹⁵ *Preparing the U.S. Foundation for Future Electric Energy Systems*, pg. 3.

3. Publish articles on GWAC in IEEE PES eNews Updates, published monthly, and their *Power & Energy* magazine.
4. Offer GWAC curriculum materials for integration into the PES Plain Talk Courses.
5. Participate on IEEE PES Education Committee.
6. Become a Collaborative Partner with the IEEE PES Workforce Collaborative.

OFFICE OF NAVAL RESEARCH (ONR)

PROGRAM TITLE: Electrical Science and Technology Program Office

URL: www.onr.navy.mil

MAIN CONTACT: Terry Ericson
Program Officer for Electrical Science and Technology
Office of Naval Research
ericset@onr.navy.mil
703-696-7741

MISSION

ONR provides technical advice to the Chief of Naval Operations and the Secretary of the Navy. ONR's Electrical Science and Technology group is focused, in part, on the reform in electric energy systems education.

DESCRIPTION

ONR works with the NSF on funding and supporting interdisciplinary programs aimed at building new partnerships focused on achieving efficient and secure electric power networks under uncertain demands. The ONR describes electric power systems as "prototypical socio-technical systems, meaning that their technical, social, economic, political, and cultural elements are tightly interwoven and impinge directly and forcefully upon each other." Their site explains that their goal is to build interdisciplinary partnerships, which allow more unified, coherent research to ensure reliable, secure, and efficient electric power networks. In addition, this program will address socioeconomic issues, environmental issues, new pedagogy and curricula to prepare a future workforce, and development of integrated tools provided by ONR or a credible utility system.

CONFERENCES/EVENTS

ONR/NSF sponsors faculty workshops with the University of Minnesota on Reforming Electric Energy Systems Curriculum with Emphasis on Renewables/Storage, Smart Delivery and Efficient End-Use. The last workshop was February 4-5, 2011 in Napa, California. A follow-on workshop is planned for February 2012. These workshops include a detailed discussion of the proposed courses, including demonstration of the laboratories, for the Reformed Curriculum on Power Systems, Power Electronics and Electric Drives.

POTENTIAL OUTREACH

1. Participate in Naval science, technology, engineering and mathematics (STEM) activities and conferences.

POTENTIAL FOR STRATEGIC ALIGNMENT

Work through Terry Ericson to participate on joint ONR/NSF curriculum development programs.

POWER SYSTEMS ENGINEERING RESEARCH CENTER (PSERC)

PROGRAM TITLE: PSERC

URL: <http://www.pserc.wisc.edu/home/index.aspx>

MAIN CONTACT Dennis Ray, Ph.D.
Deputy Director
Power Systems Engineering Research Center
608-265-3808

MISSION

Empowering minds to engineer the future electric energy system. Pursuing, discovering and transferring knowledge. Producing sustained quality university programs in electric power engineering.

DESCRIPTION

As a National Science Foundation Industry-University Cooperative Research Center, the Power Systems Engineering Research Center (PSERC) draws on university capabilities to creatively address the challenges facing the electric power industry. PSERC's membership includes 36 Industry Members, 13 universities and more than 10 collaborators.

CONFERENCES/EVENTS/RESOURCES

1. Overview of the Status of U.S. University Power Programs
<http://ecpe.ece.iastate.edu/nsfws/presentation/Dennis%20Ray.pdf>¹⁶
2. PSERC offers regular webinars with information about ongoing research at member organizations.
http://www.pserc.wisc.edu/documents/general_information/presentations/pserc_seminars/psercwebinars20112/
 - a. PSERC also offers a library of workforce development literature.
http://www.pserc.wisc.edu/documents/publications/special_interest_publications/workforce/
 - b. 2011 Calendar (watch for 2012 updates)
<http://www.pserc.wisc.edu/calendar.aspx>

POTENTIAL FOR STRATEGIC ALIGNMENT

1. Pacific Northwest National Laboratory (PNNL) collaborates with PSERC. This existing relationship could be explored further, to determine PSERC's level of interest in the GWAC curriculum. Washington State University is one of PSERC's University Members, and also works closely with PNNL.
2. If GWAC joins PSERC, the faculty webinar that GWAC is developing should be featured as a future PSERC webinar.

¹⁶ Ray, Dennis. "Overview of the Status of U.S. University Power Programs." NSF Workshop on the Future Power Engineering Workforce. Holiday Inn-Arlington, Arlington, VA. 29 Nov. 2007. Lecture.

SMART GRID EDUCATION AND WORKFORCE TRAINING CENTER

PROGRAM TITLE: Smart Grid Education and Workforce Training Center, Galvin Center

URL: http://www.iit.edu/galvin_center/smart_grid_education_and_training.shtml

MAIN CONTACT: 10 W. 35th Street,
16th Floor
Chicago, IL 60616
312-567-3000

PROJECT CONTACT: Melissa Gordon mgordon3@iit.edu

MISSION: Develop 21st Century students, workers, and infrastructures.

DESCRIPTION

The Galvin Center will oversee development and deployment of a range of educational services spanning K-12 through university levels, including technical certification and professional development. The Galvin Center created the *IIT SmartGrid Skills Requirements* table. The table defines 98 specific skills related to smart grid technical development. The Center's requirements table maps nicely to the categories of technical expertise that will be offered by the GWAC curriculum.

PARTNERS AND ALLIANCES

IEEE Power and Energy Society, Argonne National Laboratory, power companies and independent system operators throughout the country, other institutions of higher education and community colleges in the United States and abroad, agencies of the State of Illinois, associations for the promotion of green jobs, boards of high schools and higher education institutions in Illinois, and labor union training organizations.

COURSES OFFERED

Current courses offered include multi-day seminars or "Short Courses" aimed at professional development audiences. Broader course offerings are under development.

OUTREACH POTENTIAL

The Galvin Center's Smart Grid Education and Workforce Training initiative appears well aligned with GWAC's principles. It seems a natural partner of some sort. We did not speak with anyone at the Center.