Advanced Technological Education Network for Utilities and Energy Technical Education (Utilities and Energy Coordination Network)

Year 1 Evaluation Report

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Executive Summary

Northeast Wisconsin Technical College (NWTC) is addressing workforce shortages in the energy and utilities sector through the development of the *Utilities and Energy Coordination Network*. This project is designed to expand training opportunities, create new programs, and develop curricula for high-demand energy-related roles across the nation by creating a platform for industry, higher education institutions, and other stakeholders to share resources and generate partnerships in gas, electrical power, and utilities engineering to address workforce shortages.

Specific project objectives are to:

> 1) Leverage the knowledge base of the NWTC Program Advisory Committees to cultivate a core leadership group consisting of stakeholders representing national and regional employers from across the electrical power, gas, and utility engineering industry, academia, and workforce development sectors to lead the formation of the *Utilities and Energy Coordination Network* (the Network);
>
> 2) Create a clear, shared vision that guides the evolution of the Network; and
>
> 3) Establish the structure and norms of the Network to build relationships and trust among members.

In the first year of implementation, the project team began building the foundation for the Network by establishing communications mechanisms and initiating recruitment efforts, as well as learning more about the organizations in the larger network. While the COVID-19 pandemic created challenges by limiting face-to-face opportunities, the project team's attendance at virtual conferences and the development of communication tools platforms provided opportunities to engage in recruiting efforts. NWTC is highly connected to many industry organizations and educational institutions, which has significant potential for the project team's ability to grow the Network. A baseline survey of organizations highlighted key characteristics of potential Network members that can be used to focus recruitment efforts. Information is beginning to flow through the Network, both generated by the project team communication mechanisms as well as inherent to existing relationships between organizations. Some partnerships already exist between industry organizations and educational institutions in the dataset, especially around employing graduates and providing educational resources.

Based on the work that has been done in this first year, the following recommendations are made:

- Continue to build the Network by focusing efforts on those organizations who didn't respond or who are "lightly" connected to the Network.

- Begin to engage organizations through conferences and communication platforms.

- Develop and strengthen connections among organizations.

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Background

Northeast Wisconsin Technical College (NWTC) is a two-year technical college located in Green Bay, WI that offers one of the widest varieties of utility-related associate degrees, technical diplomas, and certificates in the Midwest and has partnered with local employers to meet regional economic needs for over 100 years. NWTC is also home to the Great Lakes Energy Education Center, a "living energy" laboratory featuring the latest technologies and serving as a model of sustainable building practices. NWTC's expertise and experience puts the College in an excellent position to form and facilitate a network of industry and educational partners.

Funded by the National Science Foundation (NSF) in 2020, the purpose of NWTC's *Utilities and Energy Coordination Network* grant is to create a platform for industry, higher education institutions, and other stakeholders to share resources and collaborate to expand training opportunities, create new programs, and develop curricula for high-demand energy-related roles across the nation. The Utilities and Energy Coordination Network, referred to as "the Network" in this report, project will leverage relationships developed through prior grants, including UPDATE: Utilities Pipeline Development for Advanced Technological Education (DUE#1304726) and the Planning Grant for a Utilities and Energy Regional Center of Excellence (DUE#1700673) to create a formal utilities and energy coordination network.

Despite increased enrollments at NWTC over the past six years, the needs of industry outweigh the ability of a single entity to fill the workforce pipeline. The energy industry is experiencing workforce shortages and skills gaps in key engineering and technical areas due to an aging workforce approaching retirement, changing technologies, and fewer qualified, younger candidates. Furthermore, qualified workers are increasingly choosing to work closer to their hometowns, limiting the ability to fill positions across a wider geography.

Matching industry partners to community colleges with expertise to train future technicians will be critical to addressing pipeline shortages. Such partnerships will help industry gain access to students, training expertise, and graduates who want to work close to home. Higher education institutions will benefit from industry partners who can provide input and feedback into program competencies and access to resources such as equipment, tools, and field experiences. The Network will provide a platform to cultivate and generate partnerships that can expand training opportunities in gas, electrical power, and utilities engineering to address workforce shortages across the nation.

Specific project objectives are to:

> 1) Leverage the knowledge base of the NWTC Program Advisory Committees to cultivate a core leadership group consisting of stakeholders representing national and regional employers from across the electrical power, gas, and utility engineering industry, academia, and workforce development sectors to lead the formation of the *Utilities and Energy Coordination Network* (the Network);
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This document details the Network's progress in its first year of funding.

Purpose and Design of the Evaluation

The Rucks Group, LLC (see Appendix A for author biographies) was contracted to provide external evaluation services for the Network and has worked collaboratively with project leadership to distill the evaluation methods. The project's theory of change hypothesizes that bringing industry, academia, and other stakeholders together with a shared purpose will lead to resource sharing and collaborations focused on addressing current and anticipated industry workforce and training needs through new programs and curriculum development. Guided by the logic model (see Appendix B), the evaluation design includes formative evaluation for project improvement as well as summative evaluation to gather evidence of impact continually.

Evaluation Questions

Driving the evaluation are four evaluation questions:

1. How effectively is the project team bringing together key organizations in the Network?

2. To what degree does the Network include members with the needed diverse skills to meet the goals of the Network?

3. What information, best practices, and/or resources are flowing through the Network? How does this information bring value to the Network?

4. How and to what extent is the cross-sector Network ready to set and execute strategies, including implementing workforce issues solutions?

Data Gathering Approaches

The evaluation uses a mixed-methodological approach, collecting both qualitative and quantitative evidence of the completion of deliverables (e.g., outputs) and short-term project outcomes. Data collection in the first year relied on reviews of project-level documents (e.g., meeting notes), regular meetings with the project team to understand project progress and planning, and a survey (see Appendix C) to capture baseline data on existing networks and relationships between an identified group of industry organizations and educational institutions, the types of programs currently offered by educational institutions, and awareness of utilities-related professional organizations.

The survey was sent in March 2021 to members of NWTC's Program Advisory Committees – industry representatives from each of the energy and utility areas at the College – and educational institutions that offer similar programs as identified by the College's market researcher. Of the 174 organizations invited to participate, 68 responded (39%; see Appendix D for a list of survey respondents).

The data from this survey will be used in this report to identify the extent of connections and the types of relationships between industry and education using descriptive statistics and social network analysis (SNA). SNA provides a useful methodology for describing and evaluating both the structure and development of connections ("relational ties")

between actors in a network.[1] In this project, the actors are industry organizations and educational institutions. The types of relational ties being evaluated include: advisory board service, providing instruction or instructional support, employing graduates, providing educational resources, providing internship and apprenticeship opportunities, and faculty/professional development.

Evaluation Findings

Evaluation Question #1: How effectively is the project team bringing together key organizations in the Network?

The project team currently serves as the Network's leadership, consisting of the Principal Investigator (PI), program faculty, and a project coordinator. The faculty represent the areas of interest for the Network: Utilities Engineering Technology, Gas Utility Construction and Service, Solar Energy Technology, Energy Management Technology, and Electrical Power Distribution. In Year 1, the project team addressed key implementation activities needed to bring organizations into the Network, including developing communications mechanisms and recruiting members. These steps are important in creating a formal platform with the capacity to bring together organizations from different sectors and geographies.

<u>Communications</u>

Communication is the first level of network building, creating the opportunity for shared information to serve as a foundation for cooperation, coordination, and collaboration.[2] With a goal of sustaining virtual communication capability for the long-term sustainability of a national network and working to build a network in the midst of a global pandemic with limited opportunities for face-to-face-interaction, developing a means for members to connect with one another and to recruit additional members was a key implementation task. To address these goals, the project team successfully established a website and Microsoft Teams channel as structures for information to begin flowing through the Network.

Website. The Network's web presence has been established under the auspices of NWTC's Great Lakes Energy Education Center.[3] It serves as a place to direct people for more information and to join the Network. The URL for the website is shared by the project team members when talking with potential members, on social media, and at conferences. Current data analytics for May 2021 show 55 pageviews from outside of NWTC, nearly 30% of which were on the "Join the Utilities and Energy Coordination Network" page (see Figure 1). These data provide a baseline to understand the website's reach and use by members and potential members.

39	16

■ Energy Coordination Network homepage   ■ Join the Utilities and Energy Coordination Network

Figure 1. Network website pageview analytics, May 2021.

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[1] FitzGerald, M., Leeburg, E., and Rucks, L. (2020). *Using Social Network Analysis to Evaluate the Development of Professional Connectivity*. The Rucks Group. https://therucksgroup.com/wp-content/uploads/2020/10/SNA-White-Paper.pdf

[2] Williams, B., Sankar, M., & Rogers, P. (April 2004). *Evaluation of the Stronger Families and Communities Strategy 2000-2004*. Australian Government Department of Family and Community Services.

[3] https://www.nwtc.edu/about-nwtc/places/green-bay-campus/great-lakes-energy-education-center/energy-coordination-network

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Microsoft Teams Platform. The need for a more interactive communications component led to the introduction of the Microsoft Teams platform. The Teams platform allows members to share ideas and best practices with one another towards the goal of providing a workforce that meets the needs of industry. Everyone who responded to the survey received an invitation to join. The account is hosted by NWTC and currently includes 75 guests and eight NWTC employees. It contains channels for different program areas: Electrical Power Distribution, Energy Management, Gas Utility Construction, Solar Energy, Telecommunication, and Utilities Engineering. Several informational resources are available through the main channel, including a fact sheet to assist Network members in using the platform as well as a media release about the grant, a marketing document, sample student course schedules for several programs, and plans to include information on relevant seminars and training opportunities.

Recruitment

While the global pandemic slowed the project team's ability to connect with potential Network members, recruitment efforts continued virtually when possible. In addition to reaching out to their professional networks, members of the project team were able to attend the Wisconsin Energy Workforce Conference and ATE PI Conference virtually, and they continue to discuss additional conference opportunities. A future recruitment strategy is to schedule opportunities to meet and discuss the Network with interested organizations when they are gathered at in-person conferences.

Working with the NWTC Marketing Department, the project team also developed a one-page marketing flyer (see Appendix E) that can be shared electronically and is posted both on the website and in the Teams channel. This document provides information on NWTC's role and expertise, the goals of the Network, and an invitation to join.

As the project team continues to engage in conversations about the Network, they will start to ask organizations about their motivations for joining and highlight potential synergies and common topics of interest. This information will be used to recruit new members and to build working groups among Network members with common interests. NWTC will also continue to leverage their longstanding Program Advisory Committees to understand industry and hiring trends; these committees will provide the industry voice to the project team as it continues to build the Network.

Conclusions

In Year 1, the project team established communications mechanisms and recruitment efforts. While the pandemic limited face-to-face opportunities, attendance at virtual conferences and the use of communication platforms provided opportunities to undertake recruiting efforts for the Network's development.

Evaluation Question #2: To what degree does the Network include members with the needed diverse skills to meet the goals of the Network?

The goal of the Network is to bring together organizations across sectors to share resources and form partnerships that lead to expanded training opportunities across the nation. As stated earlier, NWTC is well-positioned to build on its industry and educational connections in forming this Network. While the Network is still in the early stages of development, several organizations have already stated their commitments. Additionally, the baseline Network survey highlights valuable information to understand and recruit potential members.

NWTC Central Role

NWTC's position within the Midwest region as a premier educator in the energy discipline and its existing connections with stakeholders across the nation creates a solid basis to its role in expanding the dissemination of best practices and knowledge. NWTC began this project with many existing relationships, including regional and national industry associations, the Wisconsin Technical College System, other Midwest educational partners, and partnering centers and organizations (see Appendix F for a list of existing relationships). Social network results illustrate the extent of NWTC's connectivity to survey respondents and their partners (Figure 2).
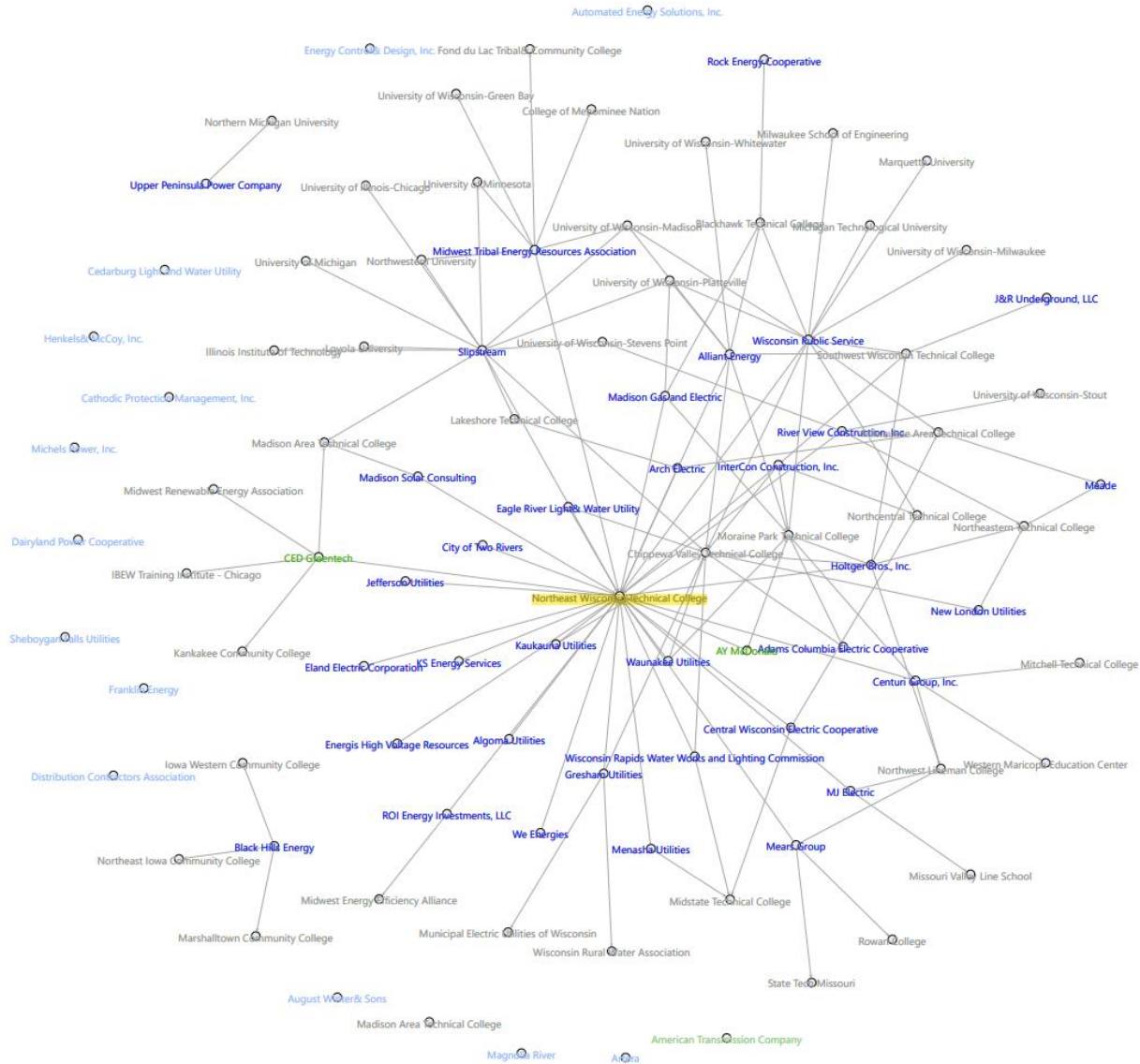
Figure 2. Network connectivity with NWTC highlighted at center.

NWTC's extensive links suggests that there is significant opportunity for the team to engage and recruit many of the organizations named as connections by its partners as they continue to develop the Network. The graphic above also highlights other highly connected industry and educational organizations towards the center, as well as those that have

few or no reported connections as shown around the outer edge. Social network data will continue to be useful in identifying those organizations that appear to be less connected to their industry or educational counterparts.

Current Network Membership

With a goal of creating a formal network, new organizations that join will be expected to commit to productive engagement. In a letter sent to organizations invited to participate in the survey, a Network commitment was defined as: participation in planning meetings; hosting or coordinating a host site for in-person meetings; sharing best practices for member recruitment and engagement; participating in the development of the Network's framework, strategic plan, and action plan; and supporting the Network by meeting with lead coordinators, completing surveys, providing connections to potential Network partners and channels for dissemination, and participating in ongoing dialogue.

The project team's recruitment activities have resulted in six organizational commitments (Figure 3).

NSF Projects/Centers	• Building Efficiency for a Sustainable Tomorrow (BEST) • Center for Renewable Energy Advanced Technological Education
Employers	• Slipstream
Technical Colleges	• Milwaukee Area Technical College (WI) • Madison Area Technical College (WI) • Northwest Energy Institute (OR)

Figure 3. Current Network commitments

These members include representatives from across the multiple sectors sought for inclusion in the Network, including technical colleges, employers, and related NSF Centers and projects.

Potential Network

The baseline survey suggests that there is significant potential for developing the Network, as well as highlighting the importance of key variables such as current connections, educational programs, and geographic locationin the effort to bring together industry and education to share resources and generate partnerships.

Connections. The Network survey serves as a baseline to identify existing relationships and as a tool to help the project team understand where they can grow Network participation and develop additional connections. The first-year survey data includes 180 organizations - primarily industry organizations - either as respondents or as named connections of respondents (Figure 4).

29%	71%

■ Educational institutions ■ Industry organizations

Figure 4. Percentage of organization types in baseline Network survey dataset.

The survey findings suggest that connections between industry and educational organizations vary, ranging from zero connections up to 30 (see Appendices G and H for complete table of number of connections per organization). As shown in Table 1, the five most highly connected educational institutions have over ten connections with industry organizations, while the top five industry organizations have slightly fewer. Among all organizations who responded to the survey, 14 industry organizations indicated no known connections to educational institutions.

| Educational Institutions	# of connections	# of employers that named institution as a connection	# of employers that institution named as a connection
Richmond Community College	30	0	30
Northeast Wisconsin Technical College	30	30	0
Northeast Community College	20	0	20
Danville Community College	12	0	12
Chippewa Valley Technical College	12	12	0

Table 1. Top five connected educational institutions.

Employer/Supplier	# of connections	# of educational institutions that named employer as a connection	# of educational institutions that employer named as a connection
Slipstream	13	0	13
Wisconsin Public Service	13	0	13
Alliant Energy	8	0	8
Holtger Bros., Inc.	7	0	7
Midwest Tribal Energy Resources Association	7	0	7

**Table 2.** Top five connected industry organizations.

Two-thirds (66%) of the organizations included in the data are not survey respondents, meaning that they were named by another organization as a connection. These less-connected organizations represent the potential of the Network and are opportunities for outreach, engagement, and recruiting. For organizations that were identified as partners by few respondents, these data will be useful for identifying where connections can be strengthened.

Educational programs. One indication of the skills that exist in the potential Network are the current academic programs offered at educational institutions. To understand the potential match between educational and training opportunities and the skillsets needed by employers, educational institutions were asked to indicate both what programs they currently offer (Figure 5) and those they are considering (Figure 6). Programs in electrical power distribution, solar energy, and utilities engineering were most frequently reported as being currently offered, with none reporting programs in cell tower/telecommunications.
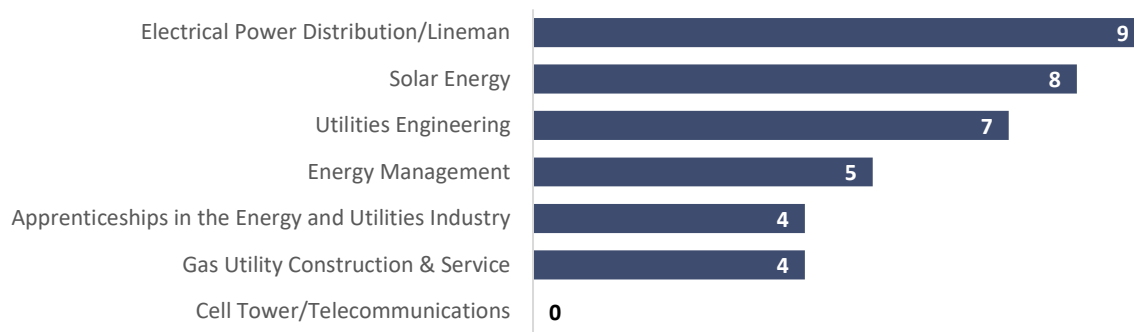
Figure 5. Programs currently offered by educational institutions.

Fewer educational institutions reported that they are considering adding programs, with solar energy and energy/utility apprenticeships being the most frequently mentioned possibilities. Few educational institutions reported that they offer gas utility construction and service programs, and most are not considering adding them.
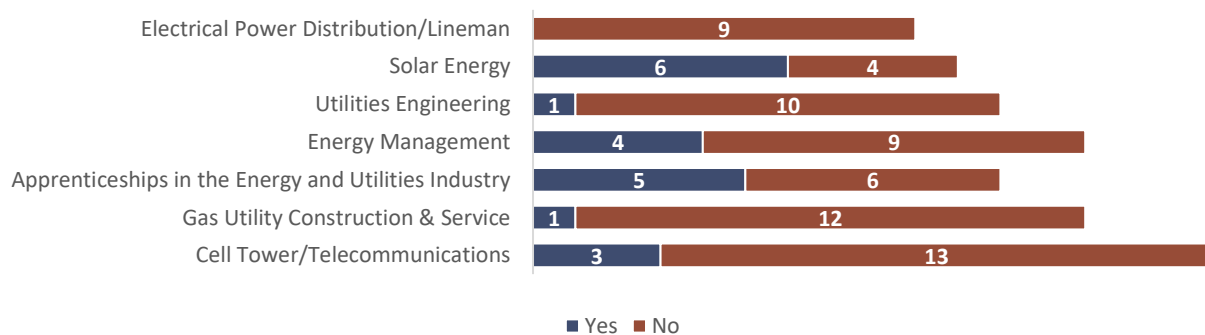
Figure 6. Programs being considered by educational institutions.

Both of these findings suggest that solar energy is a prime area for partnerships, and that apprenticeship opportunities are an important partnership concept for industry organizations and educational institutions to explore.

Geography. One goal of the Network is to help employers find educational partners in their area as many workers in this sector prefer to work close to home. While a geographic variable was not included in the survey instrument, post-hoc analysis added a state indicator for educational institutions to inform the project's goal of developing the Network to include both national and regional stakeholders. Figure 7 shows that most educational institutions are in the Midwest, primarily Wisconsin (n=24) and Illinois (n=9) with limited reach to other regions of the United States.

Figure 7. Location of educational institutions in Network dataset.

Given NWTC's role in this project, it is not surprising that most of the educational institutions in this baseline survey of the Network are located in the Midwest region. Given the multi-state presence of many employers, industry respondents were not assigned a state location in this baseline study, but future survey designs should include a geographic variable for all respondents. As the project team and the larger Network aim to broaden their geography in order to meet the needs of employers beyond the Midwest, it will be important to understand location in order to effectively connect employers with educational institutions in their area.

Conclusions

NWTC's connectivity to both industry and education shows the potential for growing the Network and has already resulted in commitments from six organizations. The baseline survey highlighted key characteristics of potential Network members that can be used to focus recruitment efforts.

Evaluation Question #3: What information, best practices, and/or resources are flowing through the Network? How does this information bring value to the Network?

Even in the nascent stage of the Network development, information is already moving through the network of industry organizations and educational institutions. Some of this information is operational or marketing material generated by the introduction of communication mechanisms as part of the Network's implementation, while other content originates from stakeholders or is inherent to partnerships between industry and education.
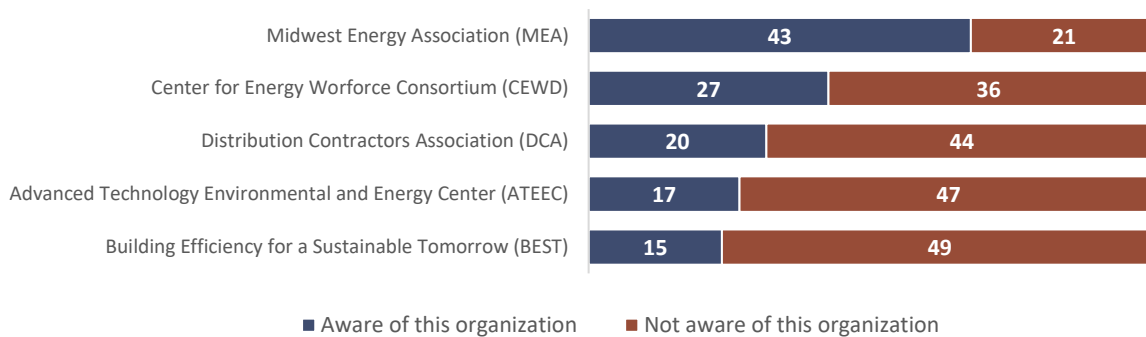
Network Operations and Marketing

The project team has ensured that key information is available on the Network website in order to inform and recruit potential members. The Network website serves both as an introduction and invitation to the Network with content about its goals, project team members, and NWTC's programs and facilities. It also provides an opportunity to share information; while the web site is still under development, at the time of this report there was information about a webinar series on maximizing facilities assessments for air and hydronic systems being offered by Slipstream, an organization that has communicated its interest in joining the Network. This announcement offers valuable information about a professional development opportunity on a topic of interest to organizations involved in the Network.

ATE Centers and Related Organizations

Additional information flowing through the network is related to respondents' engagement with Advanced Technical Education (ATE) centers and professional organizations. These organizations are a source of information and resources related to partnerships between academic institutions and industry that can inform Network goals.

The Midwest Energy Association (n= 43) is the most recognized of this group of organizations among survey respondents; fewer respondents were aware of Building Efficiency for a Sustainable Tomorrow (BEST) (n=15), an organization that has already indicated its intent to join the Network (Figure 8).

Organization	Aware of this organization	Not aware of this organization
Midwest Energy Association (MEA)	43	21
Center for Energy Worforce Consortium (CEWD)	27	36
Distribution Contractors Association (DCA)	20	44
Advanced Technology Environmental and Energy Center (ATEEC)	17	47
Building Efficiency for a Sustainable Tomorrow (BEST)	15	49

■ Aware of this organization   ■ Not aware of this organization

Figure 8. Awareness of energy and utilities-related professional organizations.

To better understand the nature of the relationship industry and educational institutions have with these energy and utilities-related organizations, respondents were also asked to indicate how they have interacted with each entity. Types of interactions with these organizations are equally distributed among newsletter subscriptions, event attendance, and membership (Figure 9), showing that at least some potential Network members are receiving information about the work of these related organizations.
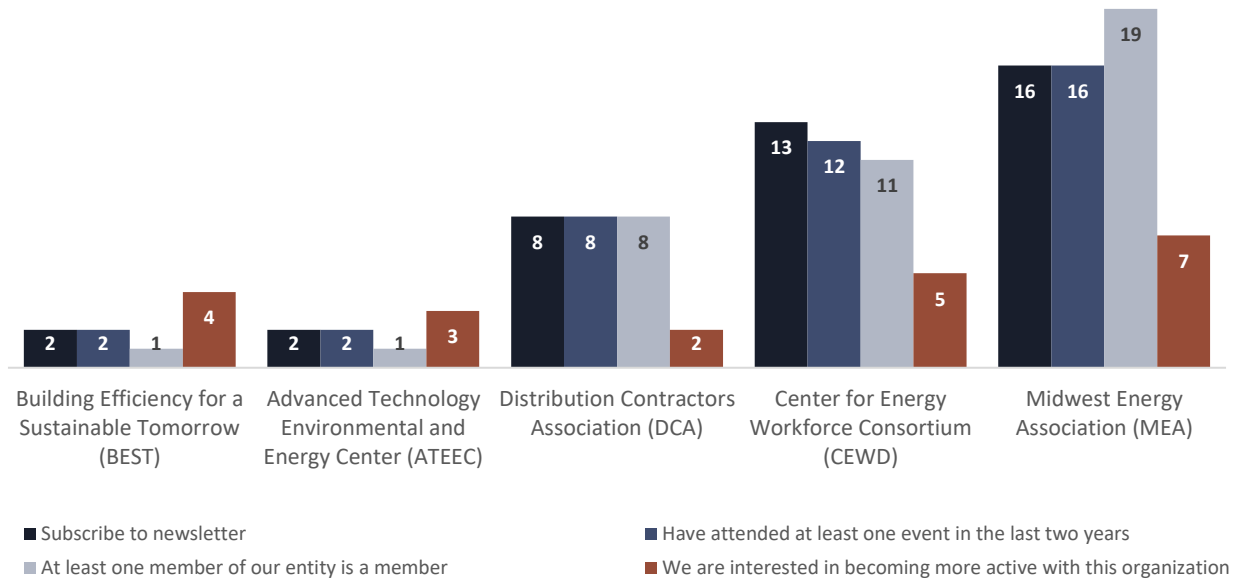
**Figure 9**. Relationship to energy and utilities-related professional organizations.

Respondents reported the highest number of interactions, as well as the most interest in becoming more active, with the Midwest Energy Association (MEA) and the Center for Energy Workforce Consortium (CEWD). These findings point towards the value of recruiting ATE centers and organizations into the Network for mutual benefit, particularly for the centers and organizations with less recognition.

Conclusions

Information is beginning to flow through the Network, both generated by the project team communication mechanisms as well as inherent to existing relationships between organizations. At these early stages of Network development, very little information is being shared through the Network communication platforms by organizations other than NWTC.

Evaluation Question #4: How and to what extent is the cross-sector Network ready to set and execute strategies, including implementing workforce issues solutions?

Partnerships between employers and educational institutions are the foundation for implementing workforce solutions. As the project team continues to develop the Network and extends its recruiting efforts, the baseline survey provides useful information about existing partnerships between employers and educational institutions who are potential Network members. The most common forms of partnership include employing graduates, advisory board service, and providing educational resources are the most common forms of partnership (Figure 10).

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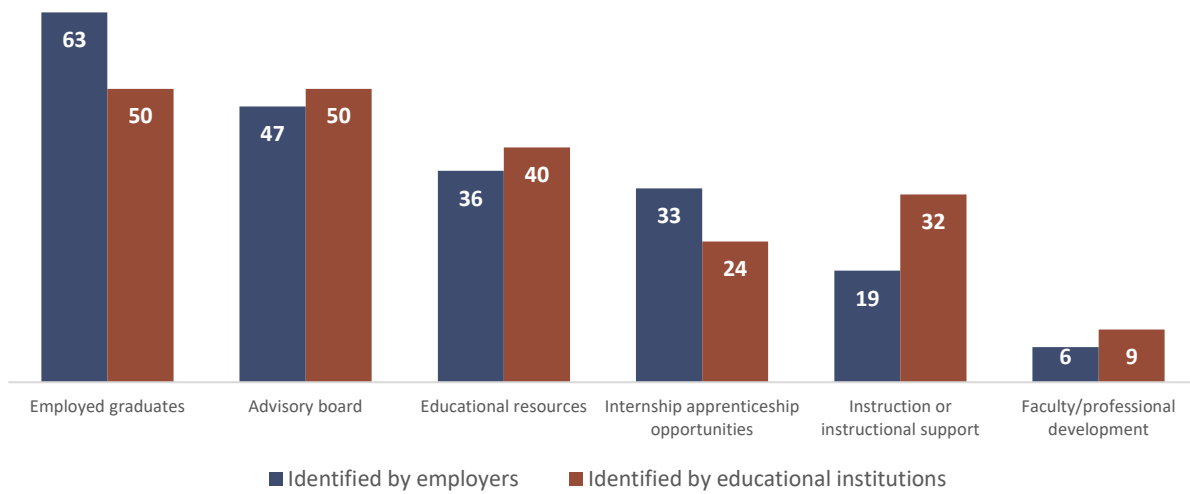
Figure 10. Frequencies of partnership types between industry organizations and educational institutions.

Fewer survey respondents reported that their organization has a relationship with industry or education based on providing internship and apprenticeship opportunities, instruction/instructional support, or faculty/professional development, indicating that these may be areas for development in the pursuit of training opportunities to address workforce shortages.

The survey data also show that the distribution of the partnership activities differs by employer. Figure 11 provides an example of the varying emphases of those employers with the highest number of reported partnerships with educational institutions.
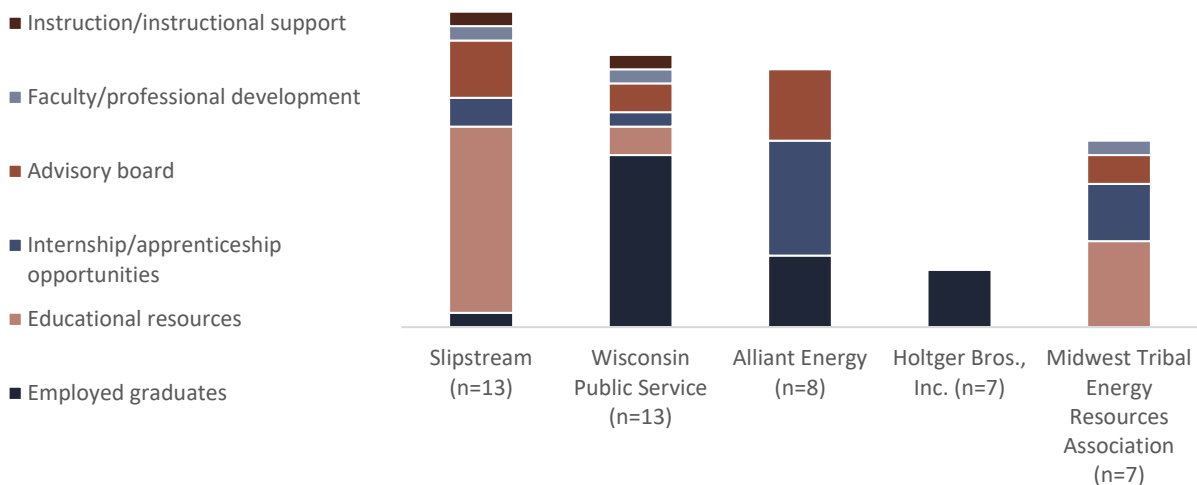
Figure 11. Example profiles of employers' partnership activities with educational institutions

For example, both Slipstream and Wisconsin Public Service have partnerships with the same number of educational institutions (n=13) and engage in each type of activity, but with different emphases on providing educational resources

and employing graduates. In contrast, Alliant Energy engages in a similar number of partnership activities but with fewer institutions and focused only on the activities of employing graduates, providing internship/apprenticeship opportunities, and serving on an advisory board. These partnership profiles can be useful to demonstrate the different forms that partnership can take, depending on employer and educational needs, as well as highlighting opportunities for potential partnership activities.

Conclusions

Employing graduates and providing educational resources characterize most partnerships between industry organizations and educational institutions. Fewer partnerships identified activities such as internship and apprenticeship opportunities, instruction/instructional support, or faculty professional development.

Summary and Recommendations

Implementation of the Utilities and Energy Coordination Network has begun with a solid start, building the foundation for inter-organizational communications and initiating recruitment through virtual conferences and professional networks. In addition, a baseline social network survey continues to provide actionable information for learning about the organizations across the potential Network. The survey highlights NWTC as highly connected to many industry organizations and educational institutions, which has significant potential for their continued ability to develop the Network. The survey illuminates key characteristics of potential Network members that can be used to focus recruitment efforts, such as connections, geographic location, and educational programs. As the Network continues to grow, information is already flowing through the Network, generated by the project team communication mechanisms as well as inherent to existing relationships between organizations. Some partnerships already exist between industry organizations and educational institutions in the dataset, especially around employing graduates and providing educational resources.

Based on these findings, the following recommendation are provided:

- Continue to build the Network by focusing efforts on those organizations who didn't respond or who are "lightly" connected to the Network. These areas of low engagement are an opportunity to tap into the potential of the Network. Continue to use the baseline survey data to identify weak connections and important characteristics for membership, including identifying additional information or attributes to focus recruitment and partnership efforts. For example, future data collection should seek to identify the difference in the types of jobs offered by organizations as well as the type of educational institutions to which they are connected (e.g., two-year or four-year).

- Begin to engage organizations through conferences and communication platforms. Aim to convene interested organizations at annual conferences and use these opportunities to learn about their activities and motivations, as well as to share more about the value and goals of the Network. Leverage the existing communication platforms by providing conversation prompts, sharing resources, and facilitating connections between organizations.

- Develop and strengthen connections among organizations. For those organizations that have already committed to the Network, engage them in recruitment and planning in order to begin cultivating ownership and shared purpose.

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More broadly, leverage common interests and existing interactions among Network members and potential participants by creating subgroups around topics of interest.

Appendix A - Author Biographies

Kathleen Lis Dean, Ph.D., provides clients with insights from her extensive experience helping organizations connect strategy, evaluation, and learning for program improvement and impact. Prior to joining The Rucks Group, she spent 20 years in evaluation and strategic leadership roles at higher education, nonprofit, and philanthropic organizations. In these roles, she leveraged qualitative and quantitative data to support organizational effectiveness, outcomes assessment, accreditation, strategic planning, and continuous improvement. Dr. Dean utilizes a collaborative approach in her work. She also draws on her research about boundary-spanning teams, strategic thinking, and organizational learning to incorporate multiple perspectives and intentional practices to help clients achieve their goals. Dr. Dean earned a Ph.D. in higher education policy and leadership at the University of Maryland, and both a master's degree in education and a bachelor's degree in international relations at the University of Delaware.

Mike FitzGerald, Ph.D. has extensive experience developing and applying quantitative and qualitative methods to assess and evaluate programs and initiatives. At The Rucks Group, Dr. FitzGerald is responsible for working on several of the firm's large and complex evaluation initiatives that require innovative solutions and technical assistance to implement successfully. Prior to joining the firm, he spent 15 years at the Cincinnati Children's Hospital Medical Center as a field service associate professor. He managed multiple concurrent evaluation projects for a range of purposes including individual performance evaluation, program evaluation, curriculum design, and organizational development. Dr. FitzGerald is a member of AEA and OPEG. Dr. FitzGerald completed his doctorate in social psychology at the University of Cincinnati and earned his bachelor's degree in psychology at Miami University.

Julia Siwierka, Ph.D., joined The Rucks Group in 2019. Dr. Siwierka's educational preparation focused on applied research methods within real-world broader systems and organizational settings. Her collaborative-focused approach to evaluation fits well with The Rucks Group's approach to evaluation. Dr. Siwierka has served as the evaluator for the Boys & Girls Clubs of South Central Kansas, assessing program impact for multiple sites and managing data collection efforts. She also worked on Kansas's System of Care evaluation funded by the U.S. Department of Health and Human Services' Substance Abuse and Mental Health Services Administration. She is a member of the Society for Community Research in Action and OPEG. Dr. Siwierka earned a doctorate in community psychology at Wichita State University.

Lana Rucks, Ph.D., brings to her work more than two decades of professional history including over 15 years of research and evaluation experience. She has extensive professional and educational knowledge of designing and implementing research and program evaluation efforts. She has led dozens of evaluation initiatives funded by various federal agencies such as the Centers for Disease Control and Prevention, Department of Labor, National Institutes of Health, and National Science Foundation. Dr. Rucks has taught at Sinclair Community College, the University of Dayton, and Wright State University's School of Professional Psychology. Dr. Rucks is a member of AEA and OPEG. She earned a doctorate and master's degree in social psychology with a concentration in quantitative methods from The Ohio State University. She also earned a master's degree in experimental psychology from the University of Dayton. At Ohio Wesleyan University she earned a bachelor of arts degree in psychology with a concentration in chemistry.

Appendix B - Logic Model

INPUTS	ACTIVITIES	OUTPUTS	SHORT-TERM OUTCOMES	MID-TERM OUTCOMES	LONG-TERM OUTCOMES
NWTC faculty subject-matter experts Relationships from two previous NSF-funded projects Past institutional history helping launch utility/energy programming around state and U.S. Industry involvement via established NWTC Program Advisory Committees	• Hire Project Coordinator to organize meetings, provide administrative support, for joint projects, create structure for information sharing, create Network web presence • Consult with NWTC Program Advisory Committees to develop plan for identifying and recruiting Network members • PI/Co-PIs travel to meet industry and academia connections and other stakeholder groups and/or to recruit members • Conduct contributions assessment of all members • Identify up to 10 individuals to serve as network facilitators and provide training to ensure meeting productivity.	• Platform identified for group communication • Network webpage created • Member commitment of 20-30 core stakeholders representing national and regional employers, educators, and national organizations • List of peripheral stakeholders interested in participating in the Network once the strategic and action plans are established • Inventory of member expertise and list of skill gaps • Select network members complete facilitation training	Increased number of entities from industry, academic, and workforce development are part of the network Increased involvement of entities from industry, academia, and workforce development	Network structures established Increased connectivity and communication Shared purpose	Network members are collaborating on research, training, and educational activities to address current and anticipated industry workforce and training needs through new programs and curriculum development.

	- Conduct a SWOT Analysis - Facilitate Network visioning session(s) - Host strategic planning sessions - Develop an action plan	- Completed SWOT analysis - Network vision statement documented - Three-year Strategic Plan 2023 Network Action Plan			
	- Convene small workgroup to discuss framework/norms; draft structure and norms; Network members review/approve - Survey members on structure and member expectations; analyze results - PI/co-PIs implement established structure and reinforce norms/member roles and expectations	- Group structure and norms documented - Plan for sustainability (e.g., member fee structure)			

Appendix C - NWTC UECN SNA Survey

Q1.1 INTRO

Q2.1 Which best describes the organization that you represent?
- o   An employer or contractor in the Energy and Utilities Industry
- o   An educational institution

Q2.2 What is the name of the organization that you represent? _____

Q3.1 As an employer, does your organization have a Energy and Utilities-related connection with any post-secondary educational institutions in your region. This would include community colleges, technical career colleges, and four-year institutions? Connections might include serving on advisory boards, providing educational resources, offering internship/apprenticeship opportunities, and so on.
- o   Yes
- o   No

Skip To End of Block If Q3.1 = No

Q3.2 Please list EVERY post-secondary educational institution with whom your organization has some type of Energy and Utilities-related connection.

- 1 _____
- 2 _____
- 3 _____
- 4 _____
- 5 _____
- 6 _____
- 7 _____
- 8 _____
- 9 _____
- 10 _____
- 11 _____
- 12 _____
- 13 _____
- 14 _____
- 15 _____
- 16 _____
- 17 _____
- 18 _____
- 19 _____
- 20 _____

Q3.3 You listed 20 institutions. Could you have listed more?

- Yes
- No

Q3.4 Please list those institutions here.

_____

_____

_____

_____

_____

Q3.5 Could we follow up with you at a later time to walk through this survey with the additional institutions? We would provide you with a list of the institutions you already mentioned.

- Yes
- No

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Q3.6 During the past 12 months, what kinds of Energy and Utilities-related connection did your organization have with each of the educational institutions you listed? *(Select all that apply)*

	1	2	3	4	5	6	7
	Advisory Board Service	Provided instruction or instructional support	Provided educational resources	Provided internship/apprenticeship opportunities	Provided faculty/professional development	Employed their graduates	Other
1	○	○	○	○	○	○	○
2	○	○	○	○	○	○	○
3	○	○	○	○	○	○	○
4	○	○	○	○	○	○	○
5	○	○	○	○	○	○	○
6	○	○	○	○	○	○	○
7	○	○	○	○	○	○	○
8	○	○	○	○	○	○	○
9	○	○	○	○	○	○	○
10	○	○	○	○	○	○	○
11	○	○	○	○	○	○	○
12	○	○	○	○	○	○	○
13	○	○	○	○	○	○	○
14	○	○	○	○	○	○	○
15	○	○	○	○	○	○	○
16	○	○	○	○	○	○	○
17	○	○	○	○	○	○	○
18	○	○	○	○	○	○	○
19	○	○	○	○	○	○	○
20	○	○	○	○	○	○	○

Q3.7 Did you think of any additional institutions as you were completing the previous questions?
- ○ Yes
- ○ No

Q3.8 Please list those institutions here.

_____

_____

_____

_____

_____

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Q3.9 Could we follow up with you at a later time to walk through this survey with the additional institutions? We would provide you with a list of the institutions you already mentioned.

o   Yes

o   No

Q4.1 Which of the following educational programs does your educational institution currently offer to students?

o   Electrical Power Distribution / Lineman

o   Gas Utility Construction & Service

o   Energy Management

o   Solar Energy

o   Utilities Engineering

o   Cell Tower / Telecommunications

o   Apprenticeships in the Energy and Utilities Industry

Q4.2 Have you considered starting one or more of these educational programs (pull forward unanswered from previous)

	Yes	No
Electrical Power Distribution / Lineman	o	o
Gas Utility Construction & Service	o	o
Energy Management	o	o
Solar Energy	o	o
Utilities Engineering	o	o
Cell Tower / Telecommunications	o	o
Apprenticeships in the Energy and Utilities Industry	o	o

Q4.3 As an educational institution, does your institution have any connections to any employers in the Energy and Utilities Industry. These connections might include members from these organizations on advisory boards connected with your institution, providing educational resources to your institution, offering internship/apprenticeship opportunities to your students, and so on.

o   Yes

o   No

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Q4.4 Please list EVERY employer in the Energy and Utilities Industry with whom your educational institution has some type of connection.

- o 1 _____
- o 2 _____
- o 3 _____
- o 4 _____
- o 5 _____
- o 6 _____
- o 7 _____
- o 8 _____
- o 9 _____
- o 10 _____
- o 11 _____
- o 12 _____
- o 13 _____
- o 14 _____
- o 15 _____
- o 16 _____
- o 17 _____
- o 18 _____
- o 19 _____
- o 20 _____

Display Q4.5 if line 20 of Q4.4 is not empty

Q4.5 You listed 20 institutions. Could you have listed more?

- o Yes
- o No

Display Q4.6 if = Yes

Q4.6 Please list those institutions here.

_____

_____

_____

_____

_____

Display Q4.7 ifQ4.5 = Yes

Q4.7 Could we follow up with you at a later time to walk through this survey with the additional institutions? We would provide you with a list of the institutions you already mentioned.

- o Yes
- o No

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Q4.8 During the past 12 months, what kinds Energy and Utilities-related connections did your institution have with each of the employers you listed? *(Select all that apply)*

	1	2	3	4	5	6	Other
	Advisory board service	Provided instruction or instructional support	Provided educational resources	Provided internship/apprenticeship opportunities for our students	Employed our graduates	Provided faculty/professional development for us	Please describe
1	○	○	○	○	○	○	○
2	○	○	○	○	○	○	○
3	○	○	○	○	○	○	○
4	○	○	○	○	○	○	○
5	○	○	○	○	○	○	○
6	○	○	○	○	○	○	○
7	○	○	○	○	○	○	○
8	○	○	○	○	○	○	○
9	○	○	○	○	○	○	○
10	○	○	○	○	○	○	○
11	○	○	○	○	○	○	○
12	○	○	○	○	○	○	○
13	○	○	○	○	○	○	○
14	○	○	○	○	○	○	○
15	○	○	○	○	○	○	○
16	○	○	○	○	○	○	○
17	○	○	○	○	○	○	○
18	○	○	○	○	○	○	○
19	○	○	○	○	○	○	○
20	○	○	○	○	○	○	○

Q4.9 Did you think of any additional institutions as you were completing the previous questions?

- o Yes
- o No

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Q4.10 Please list those institutions here.

_____

_____

_____

_____

_____

Q4.11 Could we follow up with you at a later time to walk through this survey with the additional institutions? We would provide you with a list of the institutions you already mentioned.

o   Yes
o   No

Q5.1 For each of the Energy and Utilities-related professional organizations below, please indicate if your organization is aware of it.

	Yes, we are aware of this organization	No, we are not aware of this organization
Building Efficiency for a Sustainable Tomorrow (BEST)	○	○
Advanced Technology Environmental and Energy Center (ATEEC)	○	○
Distribution Contractors Association (DCA)	○	○
Midwest Energy Association (MEA)	○	○
Center for Energy Workforce Consortium (CEWD)	○	○

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Q5.2 Please select each statement that is true with regards to your organization's relationship with each of the following Energy and Utilities-related professional organizations.

	We are subscribed to this organization's newsletter	We have attended at least one of this organization's events in the last two years	At least one member of our entity is a member of this organization	We are interested in becoming more active with this organization	None are true
Building Efficiency for a Sustainable Tomorrow (BEST)	○	○	○	○	○
Advanced Technology Environmental and Energy Center (ATEEC)	○	○	○	○	○
Distribution Contractors Association (DCA)	○	○	○	○	○
Midwest Energy Association (MEA)	○	○	○	○	○
Center for Energy Workforce Consortium (CEWD)	○	○	○	○	○

Q5.3 Please list and describe the nature of the connection between your organization and any other Energy and Utilities-related professional organization.

- 1 _____
- 2 _____
- 3 _____
- 4 _____
- 5 _____

Q6.1 We might like to follow up with you if we have any questions or want to learn more regarding your responses to this survey. Would you be willing to have a brief 10-20 minute follow-up conversation at some point?

- Yes
- No

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Appendix D - Utilities and Energy Coordination Network Survey Respondents

Educational Institutions

ATEEC
Barton Community College
CESA10 Focus on Energy
Chippewa Valley Technical College
Danville Community College
Gateway Technical College
Houston Community College
Lakeshore Technical College
MEA Energy Association
Minnesota State Energy Center of Excellence
Missouri Valley JATC
Northeast Community College
Ogeechee Technical College
Richmond Community College
Tulsa Community College
UW-Stevens Point

Employers and Suppliers

Adams Columbia Electric Cooperative
Algoma Utilities
Alliant Energy
Arch Electric
August Winter & Sons
Automated Energy Solutions, Inc.
Black Hills Energy
Cathodic Protection Management, Inc.
Cedarburg Light and Water Utility
Central Wisconsin Electric Cooperative
Centuri Group, Inc.
City of Two Rivers
Dairyland Power Cooperative
Distribution Contractors Association
Eagle River Light & Water Utility
Eland Electric Corporation

Energis High Voltage Resources
Energy Control & Design, Inc.
Franklin Energy
Gresham Utilities
Henkels & McCoy, Inc.
Holtger Bros., Inc.
InterCon Construction, Inc.
J&R Underground, LLC
Jefferson Utilities
Kaukauna Utilities
KS Energy Services
Madison Gas and Electric
Madison Solar Consulting
Magnolia River
Meade
Mears Group
Menasha Utilities
Michels Power, Inc.
Midwest Tribal Energy Resources Association
MJ Electric
New London Utilities
River View Construction, Inc.
Rock Energy Cooperative
ROI Energy Investments, LLC
Sheboygan Falls Utilities
Slipstream
Upper Peninsula Power Company
Waunakee Utilities
We Energies
Wisconsin Dells Utilities
Wisconsin Public Service
Wisconsin Rapids Water Works and Lighting Commission
American Transmission Company
AY McDonald
CED Greentech
Trane

Appendix E - UECN Marketing Piece

UTILITIES AND ENERGY COORDINATION NETWORK

Building the skilled energy workforce together
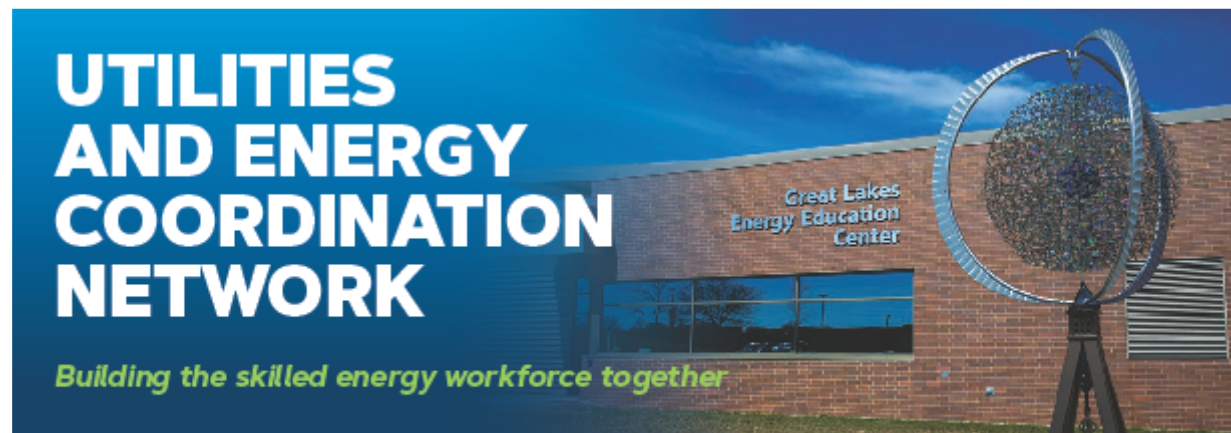
You're invited to join the Utilities and Energy Coordination Network, a group of educators, industry leaders, and workforce developers with a clear, common purpose — to close the workforce gap in the energy industry. Together, we will advance technology education so students across the country can succeed and become contributing members of the energy workforce and communities.

The need for skilled technicians in the energy industry is startling. Looming retirements and changing technologies impact 72 percent of employers nationwide. Workers with engineering and technical skills are in high demand — yet qualified candidates are in short supply.

Utilities and Energy Coordination Network members will:

Share information and collaborate toward these goals/outcomes:

1. Increased offered programs in the utilities and energy sectors.

2. Increased students graduating from utilities and/or energy programs to fill workforce gaps.

3. Faculty continuously trained on the latest industry trends.

Join the Utilities and Energy Coordination Network today!

To learn more about this National Science Foundation grant funded project visit:

nwtc.edu/EnergyNetwork

Or contact: bonniewillems@nwtc.edu | 920-498-5451

About the Network

Leading the Network's efforts is Northeast Wisconsin Technical College. NWTC is a two-year technical college with a long history of fostering partnerships to provide education and training opportunities for the development of a skilled workforce. NWTC has one of the widest varieties of utility-related programming in the Midwest. The College offers the Utilities Engineering Technology, Solar Energy Technology and Energy Management Technology associate degrees and Electrical Power Distribution and Gas Utility Construction and Service technical diplomas. The college is also home to Lineworker and Substation apprenticeships.

In 2018, NWTC opened the Great Lakes Energy Education Center, a 32,000 square-foot facility to house its energy and utilities programs. The Center is a living energy laboratory, featuring the latest technologies and serving as a model of sustainable building practices. NWTC is one of few education institutions in the nation that tie energy generation and conservation to distribution.

The goal of the Utilities and Energy Coordination Network is to build on this expertise and give education, industry, and professional organizations a platform to share resources and form partnerships that will lead to expanded training opportunities across the country. Once developed, the Network will continue virtual communication to ensure long-term sustainability.

NORTHEAST WI Technical College

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Appendix F - NWTC's Existing Relationships

Sector	Stakeholders
Wisconsin Technical College System (WTCS) Educational Partners	• Blackhawk Technical College (Janesville, WI) • Chippewa Valley Technical College (Eau Claire, WI) • Gateway Technical College (Kenosha, WI) • Fox Valley Technical College (Appleton, WI) • Lakeshore Technical College (Cleveland, WI) • Madison College (Madison, WI) • Midstate Technical College (Wisconsin Rapids, WI)
Midwest Educational Partners	• Dakota County Technical College (Rosemount, MN) • Lansing Community College (Lansing, MI) • Mitchell Technical Institute (Mitchell, SD) • Minnesota Energy Center • Raritan Valley Community College (Branchburg, NJ)
Industry Partners	• Alliant • InfraSource • Michels Corporation • Henkels & McCoy, Inc. • Xcel Energy • The WEC Energy Group • WPS
Partnering Centers and Organizations	• Advanced Technology Environmental and Energy Center (ATEEC) • Building Efficiency for a Sustainable Tomorrow (BEST) Center • Midwest Educational Association • Midwest Photonics Education Center (MPEC)

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Appendix G - Educational Institutions' Degrees of Connection

The following table lists the educational institutions that either completed the social network survey and/or who were mentioned by an employer as a connection, in descending order of total connections.

Educational Institutions	# of connections	# of employers that named institution as a connection	# of employers that institution named as a connection
Richmond Community College	30	0	30
Northeast Wisconsin Technical College	30	30	0
Northeast Community College	20	0	20
Danville Community College	12	0	12
Chippewa Valley Technical College	12	12	0
Houston Community College	11	0	11
Moraine Park Technical College	9	9	0
Tulsa Community College	7	0	7
Southwest Wisconsin Technical College	5	5	0
University of Wisconsin-Stevens Point	5	2	3
Northeastern Technical College	4	4	0
Milwaukee Area Technical College	4	4	0
Northwest Lineman College	4	4	0
Blackhawk Technical College	4	4	0
University of Wisconsin-Madison	4	4	0
University of Wisconsin-Platteville	4	4	0
Midstate Technical College	3	3	0
Northcentral Technical College	3	3	0
Lakeshore Technical College	2	2	0
ATEEC	2	0	2
Northwestern University	2	2	0
University of Minnesota	2	2	0
Madison Area Technical College	2	2	0
Midwest Renewable Energy Association	2	2	0
Northern Michigan University	1	1	0

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Northeast Iowa Community College	1	1	0
Marshalltown Community College	1	1	0
Iowa Western Community College	1	1	0
Missouri Valley Line School	1	1	0
Midwest Energy Efficiency Alliance	1	1	0
State Tech Missouri	1	1	0
Rowan College	1	1	0
Madison Area Technical College	1	1	0
University of Wisconsin-Stout	1	1	0
College of Menominee Nation	1	1	0
University of Wisconsin-Green Bay	1	1	0
Fond du Lac Tribal & Community College	1	1	0
University of Wisconsin-Whitewater	1	1	0
Mitchell Technical College	1	1	0
Western Maricopa Education Center	1	1	0
Municipal Electric Utilities of Wisconsin	1	1	0
Wisconsin Rural Water Association	1	1	0
University of Michigan	1	1	0
Loyola University	1	1	0
University of Illinois-Chicago	1	1	0
Illinois Institute of Technology	1	1	0
Kankakee Community College	1	1	0
IBEW Training Institute - Chicago	1	1	0
Michigan Technological University	1	1	0
University of Wisconsin-Milwaukee	1	1	0
Milwaukee School of Engineering	1	1	0
Marquette University	1	1	0
Gateway Technical College	0	0	0

Appendix H - Industry Organizations' Degrees of Connection

The following table lists the employers or suppliers that either completed the social network survey and/or who were mentioned by an educational institution as a connection, in descending order of total connections.

Employer/Supplier	# of connections	# of educational institutions that named employer as a connection	# of educational institutions that employer named as a connection
Slipstream	13	0	13
Wisconsin Public Service	13	0	13
Alliant Energy	8	0	8
Holtger Bros., Inc.	7	0	7
Midwest Tribal Energy Resources Association	7	0	7
Centuri Group, Inc.	5	0	5
InterCon Construction, Inc.	5	0	5
CED Greentech	5	0	5
Black Hills Energy	3	1	4
Gresham Utilities	4	0	4
Madison Gas and Electric	4	0	4
Mears Group	4	0	4
River View Construction, Inc.	4	0	4
AEP Utilities	0	3	3
Arch Electric	3	0	3
Central Wisconsin Electric Cooperative	3	0	3
MJ Electric	3	0	3
Waunakee Utilities	3	0	3
Wisconsin Rapids Water Works and Lighting Commission	3	0	3
AY McDonald	2	0	2
Adams Columbia Electric Cooperative	2	0	2

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Doble Engineering	0	2	2
Dominion Energy	0	2	2
Duke Energy	0	2	2
Eagle River Light & Water Utility	2	0	2
Kaukauna Utilities	2	0	2
Madison Solar Consulting	2	0	2
Meade	2	0	2
Menasha Utilities	2	0	2
New London Utilities	2	0	2
North American Substation Services	0	2	2
ROI Energy Investments, LLC	2	0	2
We Energies	1	1	2
AET Engineering	0	1	1
Algoma Utilities	1	0	1
Appalachian Power	0	1	1
Atlantic Power Sales	0	1	1
Burt County Public Power	0	1	1
Butler Public Power	0	1	1
Carolina Power and Signal	0	1	1
Cedar-Knox Public Power	0	1	1
CenterPoint Energy	0	1	1
Champion	0	1	1
Chesapeake Energy Corporation	0	1	1
Chimney Rock Public Power	0	1	1
City of Two Rivers	1	0	1
Cornhusker Public Power	0	1	1
Crown Castle	0	1	1
Cuming County Public Power	0	1	1
Custer Public Power	0	1	1
CW Wright	0	1	1
Danville Utilities	0	1	1

Dawson Public Power	0	1	1
Devon Energy	0	1	1
DSI Directional Service	0	1	1
Eland Electric Corporation	1	0	1
Elkhorn Rural Public Power	0	1	1
Enable Midstream Partners	0	1	1
Energis High Voltage Resources	1	0	1
Entergy	0	1	1
Exxon	0	1	1
High Voltage Inc.	0	1	1
High West Energy	0	1	1
Independent Energy Systems	0	1	1
Irby	0	1	1
J&R Underground, LLC	1	0	1
Jefferson Utilities	1	0	1
KBR Public Power	0	1	1
KS Energy Services	1	0	1
Lee Electric	0	1	1
Lincoln Electric System	0	1	1
Lumbee River Electric	0	1	1
Marlboro Electric	0	1	1
Mastec	0	1	1
MCA of Oklahoma	0	1	1
Mecklenburg Utilities	0	1	1
Megger	0	1	1
Moxie Solar	0	1	1
NC EMC	0	1	1
Nebraska League of Municipalities	0	1	1
Nebraska Municipal Power Pool	0	1	1
Nebraska Public Power	0	1	1
Nebraska Rural Electric Association	0	1	1

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Norris Public Power	0	1	1
ONEOK, Inc.	0	1	1
Pee Dee Electric	0	1	1
Pike Electric	0	1	1
Power Grid Engineering	0	1	1
Prime Morris	0	1	1
Public Service Company of Oklahoma	0	1	1
PWC	0	1	1
Qualus Power	0	1	1
Quanta	0	1	1
Reliant	0	1	1
Rock Energy Cooperative	1	0	1
Saber	0	1	1
SC EMC	0	1	1
Schweitzer Engineering Laboratories, Inc.	0	1	1
SEL	0	1	1
Shell	0	1	1
Siemens Energy	0	1	1
Southeast Power	0	1	1
SPX Transformers	0	1	1
Sumpter Utilities	0	1	1
Superior Cranes	0	1	1
Tellespen	0	1	1
UPA	0	1	1
Upper Peninsula Power Company	1	0	1
Volt Power	0	1	1
Weston Power Plant	0	1	1
Wheatbelt Public Power	0	1	1
Williams Co., Inc.	0	1	1
Wyrulec Company	0	1	1
American Transmission Company	0	0	0

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Artera	0	0	0
August Winter & Sons	0	0	0
Automated Energy Solutions, Inc.	0	0	0
Cathodic Protection Management, Inc.	0	0	0
Cedarburg Light and Water Utility	0	0	0
Dairyland Power Cooperative	0	0	0
Distribution Contractors Association	0	0	0
Energy Control & Design, Inc.	0	0	0
Franklin Energy	0	0	0
Henkels & McCoy, Inc.	0	0	0
Magnolia River	0	0	0
Michels Power, Inc.	0	0	0
Sheboygan Falls Utilities	0	0	0

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