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CEWD: Closing the Skills Gap

As Ann Randazzo, executive director of the Center for Energy Workforce Development (CEWD), prepared to address the annual board meeting on March 5, 2018 (see **Exhibit 1** for 2018 goals), she wondered if she should give the CEWD an "A" for succeeding or an "F" for failing on its mission. CEWD was a nonprofit consortium of companies and organizations in the utilities industry that was working to develop the future workforce for the industry through career awareness initiatives, workforce development and education programs, and industry support programs.

The group was founded in 2006 when a number of utility company CEOs came together to tackle the issue of an impending retirement bubble. As older workers retired, they would drain the utility industry of knowledge and experience if the next generation of workers was not in the talent pipeline. Due to the Great Recession, many workers staved off retirement, and the utility industry dodged the bullet. But almost immediately a new workforce challenge emerged. As in many other industries, utilities were struggling to find the right candidates for jobs that required more than just a high school education, but less than a four-year college degree.[1]

CEWD embraced the challenge. It was the first industry organization in the U.S. to implement an industry-wide, national effort to close the skills gap in key occupations such as linesmen, technicians, and operators. CEWD plunged into identifying the critical jobs; determining the must-have skills required for the jobs given the changing nature of technology; specifying credentials; developing curricula in areas like math and problem solving; and listing best practices for employers to engage educators. For more than a decade, CEWD had created training toolkits and curricula for skills development and made the content freely available to its member companies.

By most accounts, the CEWD had done a great job. Randazzo was often invited to speak to other industry associations on how CEWD managed to get member companies to collaborate rather than compete on workforce development. But looking back on the past decade, Randazzo wondered if CEWD should have held itself to a higher standard.

> In the beginning, we were faced with one immediate issue—an aging workforce and how to quickly rebuild a talent pipeline to fill those vacancies. We weighed the idea of national standards against a faster approach of creating a variety of solutions that

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companies could choose from and adapt for their own use. We chose the path of creating toolkits and education solutions and didn't mandate that members use the curriculum or implement the best practices in a standardized way, and we didn't require companies to provide metrics on their use. That allowed us to produce resources for a wide range of users, and small companies had access to the same material as large companies since the contribution was based on size. But maybe we should have been more prescriptive and perhaps that might have had more impact in the long run? Maybe we should have had a standard and insisted that companies follow it in order to be a CEWD member? The board helped us establish the right path, but were we really providing value to our members and the industry?

The U.S. Utilities Industry in 2018

The companies and organizations of the utilities industry provided natural gas and electricity to consumers and businesses throughout the U.S. Total industry revenue topped $500 billion in 2017.[2] Electric utilities produced power through various means—nuclear, fossil fuels, hydroelectric, and renewables such as wind and solar—and distributed that power to customers. Natural gas utilities used pipelines to transmit gas from regions of production or port terminals to customers. Both industries were highly regulated in the U.S.

Electric utilities generally followed three kinds of business models. Investor owned utilities (IOUs) were private, for-profit companies that responded to the demands of shareholders; many of the largest, vertically integrated regional utilities in the U.S. were IOUs. Municipal utilities were owned and operated by cities or towns. Most municipal utilities purchased wholesale power from IOUs or the wholesale market and distributed it to local residents. Cooperative utilities (coops) were owned by their members. Like municipals, coops generally purchased wholesale power.

Recent technological advances and changes in consumer sentiments had led to the growth of distributed electrical generation—rooftop solar and individual wind turbines—that had begun to reduce demand from traditional utilities. Coal-fired power plants, which once made up the majority of U.S. electricity generation, were increasingly supplemented by natural gas and renewable sources of energy. The shift in the fuel-generation mix impacted the workforce required by the utility industry, both in terms of the number of workers, as well as the skills required. For example, it took fewer people to run a natural gas plant than a coal-fired plant; and generating wind energy required many more people with the skills to build a windfarm compared to very few people required with the skills to maintain a windfarm. Other important trends in the utilities industry included upgrading the infrastructure and technology of the distribution system to make it safer and more reliable, and continuing consolidation and deregulation of markets.

Utilities Industry Workforce

About 600,000 people worked in the utilities industry in the U.S. in 2018.[3] Job growth in the industry was estimated at about 6% annually.[4] The workforce was generally less diverse than the U.S. as a whole. Only about 34% of workers in the industry were women, below the national average of 47% for all industries, and only about 9% were African American (below the national average of 12%).[5] About 5% of the workforce was unionized.[6] About 10% of utilities workers were veterans, which was above the national average.[7]

A recent industry trend was the growth of contractors to supplement the utilities industry workforce. In the utilities industry, contractors could make up 50% or more of the workforce of a large,

vertically integrated regional utility at any given time. The use of contractors allowed utilities to respond to temporary swells in demand for workforce cheaply and easily. Recognizing these trends, Randazzo explained that CEWD decided to: 1) invite contractors to join CEWD as members of the organization, and 2) to build in contractor workforce needs into CEWD's overall plan for developing talent for the utilities industry, when working with schools and community colleges.

Wherever people lived, the utilities industry worked, producing and distributing the power that lit their homes and powered their businesses. Electricity production could, to some extent, be separated from where it was used—electricity generated at Niagara Falls might travel all the way to New York City, 400 miles away, before it was used—but most power was produced relatively close to where it was consumed. Much of the work of the utilities industry was still very hands-on in 2018. Melissa Anderson, executive vice president and chief human resources officer of Duke Energy, one of the largest electric utilities in the U.S., explained that automation had not had a major impact on the utilities industry as of 2018. She explained:

> Technology has changed jobs. Meter readers are being replaced by technology that allows for remote readings. Service technicians have to be able to use computers and technology in their trucks. But there aren't many utilities jobs that a robot could take over. It's not like an assembly line in a factory. These jobs require understanding of how circuits work and how energy flows, and a certain intuition and problem solving ability.

The Middle Skills Gap

The term "middle skills" is often used to describe jobs that require workers with more education than a high-school diploma, but less than a four-year college degree. Randazzo and others at CEWD objected to the term. She explained, "These are high skilled jobs. They don't require a four-year degree, so maybe they are 'middle education' jobs, but calling them 'middle skill' takes away from the work these employees are doing. It makes them less appealing, so that's not how we think of the jobs."

The U.S. unemployment rate in early 2018 was about 4%, with about 6.8 million Americans looking for jobs.[8] At the same time, there were about 6 million job openings across the country, which was a record high.[9] The mismatch was due to three factors: geographic disparity—more jobs were available in the Southeast, while more job hunters were in the Northeast; degree inflation, in which companies inflated job requirements beyond what the work actually required, such as requiring a bachelor's degree for a job as a receptionist, which made jobs harder to fill;[a] and the middle skills gap.

Middle-skills jobs made up 53% of U.S. jobs in 2015.[10] Fields with high levels of open middle skills jobs in 2018 included health care, manufacturing, and business services. These jobs were projected to grow to 56% of the total workforce by 2022.[11] In contrast to higher skill positions such as executives or professionals, and lower skill positions such as retail or hospitality workers where the supply of workers met or exceeded the demands of the labor market, with middle skill jobs, there were many more job openings than there were workers to fill them.[12] In 2018, analysts estimated that there was about a 10% gap in the overall labor market between the supply of qualified workers for middle skills jobs and the number of jobs available.[b13]

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[a] For more information on degree inflation, see Joseph Fuller, Manjari Raman, et. al., "Dismissed by Degrees," published by Accenture, Grads of Life, Harvard Business School, October 2017.

[b] For more information on the middle skills gap, see Harvard Business School U.S. Competitiveness Project, "Bridge the Gap: Rebuilding America's Middle Skills," https://www.hbs.edu/competitiveness/Documents/bridge-the-gap.pdf.

Most businesses in 2018 tended to hire on the spot market and competed for talent that was already trained and available.[14] The net result was that while millions of qualified Americans were seeking employment, businesses complained that they could not readily find trained workers. Some companies were willing to offer on-the-job training for middle skills jobs. Many vocational industries had longstanding programs to offer apprenticeships to new workers in their industry. Unions often organized and regulated these apprenticeships. One complaint reported in these circumstances was that the pool of interested and qualified applicants was too small.

Many middle skills jobs offered decent wages. Entry-level middle skills positions could command salaries of around $20/hour. Many middle skills positions had career ladders that could lead to six-figure salaries after several years of experience.[15] However, it was often a challenge for potential employees to determine what training they needed for the job and to then seek out that training at community colleges or technical training centers.

Because middle skills jobs did not require a college degree, many potential employees saw them as less prestigious than other avenues they could pursue. Parents could also be a problem, pushing their children to attend a four-year college, even when earning a liberal arts degree did not necessarily equip young people for the labor market they would face after graduation. Jeff Weld, a senior policy adviser to the White House on science, technology, engineering, and mathematics education explained, "The typical family Christmas letter likes to brag on the kids going to four-year institutions. . . . It's harder to sell, 'my kid is a welder' even though a modern welder can make great pay."[16]

CEWD's Early Days

Founding

In 2006, the leaders of several large utilities and industry trade groups formed CEWD. The founding group included utilities Duke Energy, Southern Company, Public Service Enterprise Group (PSEG), and Xcel Energy among several others, and trade groups Edison Electric Institute (EEI), Nuclear Energy Institute (NEI), and the American Gas Association (AGA). The human resources (HR) managers and executives of these firms had begun to understand that the utilities industry would soon be facing a labor crunch because of its aging workforce in key positions such as line workers and engineers. Paul Bowers, an executive at Southern Company, helped push for the creation of CEWD. He noted, "The utilities industry has always recognized the importance of workforce development and the critical need for us to continuously evolve how we approach workforce planning. We started CEWD to ensure we had the right programs in place that would better position the industry to withstand long-term workforce trends." Randazzo described CEWD's birth:

> Back in 2005, our industry was experiencing a lot of growth. At the same time, we were facing a good number of people who were getting older, and we saw the potential of retirements just zapping our industry in terms of the workforce. We had not hired in many years because we had an experienced workforce. We had some forward-thinking people come together and ask the question, "How are we going to deal with this? What can we do better together than we can do separately?" That was the start of CEWD.

Tom Kuhn, president of EEI, explained that CEWD took some time to get off the ground. He noted:

> There wasn't anyone who was truly against the creation of CEWD, but some organizations were a bit reluctant to participate at first. Our challenge was to explain the unique nature of this industry collaboration to large companies and small companies

> alike. We also needed to ensure that all segments of the energy industry—electric companies and cooperatives, natural gas companies, and nuclear companies—understood how they would benefit from this partnership. Over time, people have seen the benefits of working together and the results CEWD can drive.

Randazzo began working with CEWD soon after it was formed. She had worked for Georgia Power in various business and technology positions for more than 20 years before starting her own utilities consulting firm. Her wealth of experience and industry connections helped bring CEWD together, but she deferred credit to others in the industry. She said:

> I think what probably is the bedrock of our founding, as it is in everything we do, is individuals. It's a person who sees something and has the passion to pull together whoever needs to help, and make it happen. Back in those early days there were a few people from Southern Company and other firms who got together. One was Penny Manuel, who became an early CEWD chairperson. She had the vision to say, "We have just got to do something about this—either as a region or as a country—to make this work." These are the kinds of jobs that can't be outsourced. We have to have them in every state, in every county, every place that you want the lights to come on. And we have to grow that workforce ourselves.

CEWD was founded as a 501(c)3 nonprofit organization. Funding for the organization was provided by the member utilities and trade associations (see **Exhibit 2**). In-kind donations from EEI supported CEWD's back-office needs. CEWD was overseen by a board of directors made up of utilities industry executives and other stakeholders. An executive council and workforce planning council advised the organization's officers and staff on operations. Randazzo explained that CEWD was created as a virtual organization with no physical office space:

> We have somebody in North Carolina, somebody in Florida, somebody in New Jersey, somebody in Michigan, and we're all independent contractors that come together to work on projects. The way we're able to do that is through the generosity of the EEI that provides all of our back-office support, including accounting, membership management, and legal support. We all work from home, but if we need a place to meet, any of the trade associations have offered their workspaces. The reason we set it up that way initially was because we felt it was a short term project, and there wasn't a point in finding a permanent spot to get people to come to work.

As Randazzo noted, CEWD was envisioned as a short term project that would disband after solving the retirement problem facing the utilities industry.

Facing the "Silver Tsunami"

CEWD's original mission was to understand and address the utilities industry's retirement bubble. Geisha Williams, PG&E Corporation[c] CEO and President, and a former board chair of CEWD, described it as a "silver tsunami." As she explained, "Across the industry in the early part of the 2000s, we were looking at a significant wave of retirements in certain jobs with the potential to impact our ability to serve the customer." A 2007 Department of Labor publication presented the problem:

> Perhaps the most complex and pressing challenge facing the energy industry is the retirement of incumbent workers. The average age of workers currently employed in the

[c] PG&E Corporation was the corporate parent of West Coast utility Pacific Gas & Electric.

> energy industry is near 50, and the average age at which most workers retire is 55. Within the next 5 to 10 years, many companies will need to replace a huge portion of their workforce. This demographic phenomenon presents the energy industry with the succession planning challenge of losing critical institutional knowledge in occupations for which replacements are often most difficult to find: supervisors and management. The industry lacks a pipeline of new workers large enough to replace retiring workers while also meeting employers' growing need for additional personnel. Industry reports that, in their experience, recruiting new workers is hampered by the fact that individuals choose career paths at younger ages than those traditionally targeted by industry recruiting efforts. Therefore, the pipeline development challenge is closely related to the other challenges of image and adequate education programs.[17]

Randazzo and a small group of consultants worked together to address the problem. They first identified which would be the most critical jobs. They determined that line workers, plant field operators (who worked in power plants), skilled technicians (who maintained the power grid), and engineers were the four roles most at risk of being hit hard by the retirement bubble. Randazzo explained, "Those four roles make up about 44% of our workforce, and they are truly the boots on the ground keeping the lights on and the gas flowing." The team took a series of steps to understand and address the problem from multiple angles, including workforce planning, career awareness, and competency development. Randazzo explained that the natural inclination of people in the utilities industry was to work together: "One of the things that makes our industry unique, and has really helped us in this effort, is the fact that we are used to working together. When there's a storm, everybody gets in their trucks. Even if we compete in certain areas—including for workforce—we've all got to work together to build this pipeline or there just aren't going to be enough people. I don't know why more industries can't get together on problems like the utilities companies have."

Workforce planning "Workforce planning is the first step," explained Randazzo. She continued, "We created tools so that companies and states could look at what their utilities labor demand is, what the potential labor supply is—whether it's from schools, or from the military, or people moving from other industries." CEWD offered these tools to all members so that they could make accurate predictions about future workforce needs. The team discovered that, while there were some commonalities between states, regions, or companies, there would be no one-size-fits-all solution. Randazzo noted, "It may be that one company is pretty well set on diversity initiatives, but what they really need is to focus more on students in high schools. Or we have some that are really doing a great job in high schools, but have no connections to community colleges. Everybody is kind of at a different place. So we had to understand each labor market separately for our work to be useful." She continued, "We've learned that hiring tends to happen locally. People aren't usually hired in from another state or another region because these jobs are local. Every community needs them. That matters because if a company is going to invest in training an employee, they like to know that that person is unlikely to jump to a competitor because they would have to go to another state or region."

Career awareness Randazzo and her team discovered that career awareness was another problem—potential applicants did not seem to know that the jobs in the utilities industry existed, or that they offered wages high enough to support a family (see **Exhibit 3**). Beth Reese, executive vice president and CFO of Southern Company Gas, and chair of CEWD's board of directors in 2018, explained her thoughts on why CEWD's career awareness work was necessary:

> As an industry, we have an opportunity to really tell our story better. We're very focused on making sure that we reliably deliver energy—whether it's electricity or gas—and our customers don't worry about whether their furnace is going to turn on if it's really

> cold outside, or if the lights are going to come on when they get up in the morning. And that's really great from our perspective, but it's not great if you're trying to recruit talent into the industry. People don't really think of the utilities as a great place to work because they don't really see the utilities. CEWD is a tool that we've been able to use as an industry to really do more of a grassroots effort to tell the story about what our industry is and what jobs we have. These are great jobs that do not require a college degree.

Randazzo explained how CEWD thought about career awareness, "After we determined which roles would command our attention—line workers, technicians, plant field operators, and engineers—our job became to figure out what's the best way to do career awareness. We had to get the word out about these jobs. We focused, as part of that, on youth, low-income adults, women, military, and transitioning adults as potential groups who would be good fits for these jobs."

CEWD created websites to appeal specifically to some of these groups. One important project was "Get Into Energy." This project aimed at schools, including students, parents, teachers, and guidance counselors, and attempted to educate these audiences about careers in energy. The project's website, www.getintoenergy.com, which was launched in 2006, provided videos and other digital content with information about careers in the energy field. It also provided content to help those interested in the industry develop the technical and math skills needed to prepare them for such a career.

A site geared towards veterans and those exiting the military, www.troopstoenergyjobs.com, launched in 2012 (before 2012, information for veterans had appeared on the Get Into Energy site), laid out an interactive career roadmap for veterans considering a career in the utilities industry. The roadmap offered information on different jobs in the industry, and the different paths a veteran might take to those jobs. Some veterans might have developed skills in the military that would be directly applicable to working for a utility, while others might require additional education or hands-on training. Anderson, of Duke Energy, explained that part of making jobs more appealing to veterans involved some work on the company side: "We had to adjust job descriptions and requirements to account for the fact that a lot of veterans might not have formal training or certifications, but they've developed the experience working with machines and technology in the military that can be very applicable to our work." CEWD also worked with the Department of Defense and with specific military bases around the country to spread the word about their jobs.

Creating Educational Materials

CEWD's work in career awareness, including building examples of career pathways, led Randazzo and her team to understand the need for educational materials. The work began with the four job categories they chose to focus on and the five types of people to whom they hoped their jobs would appeal. Randazzo explained, "We first had to determine what were the competencies necessary for each of those jobs, what are the competencies shared across jobs, and how might someone go about acquiring those competencies." Randazzo explained the process, "We asked the question, 'What do the people in these jobs need to be able to know and do?' We developed a competency model. We pulled together subject matter experts from all over the industry and had focus groups. They developed a set of learning objectives that schools could take and use to build a curriculum." (See **Exhibit 4**.)

An early decision involved what sort of content CEWD would produce. Randazzo explained:

> We decided that we would produce tools and processes that could be adapted by companies or schools. At that time there was a big push for standards, for having one common way to train across the industry. But we knew that each company had different equipment and systems even though they all connect to form the grid. Each has a different

> way of training. In order to get something going, we decided that we would create things that a company or school could pick up and adapt and use on its own. We developed flexible toolkits that could be used to develop competencies in workers. We thought that trying to develop a common curriculum for, for example, instrument and control technicians, which could be applied across the industry in a standard way, would just be impossible.

CEWD's competency models and educational materials were freely available on its website and were given to all members. Anderson explained how Duke Energy took advantage of CEWD's work:

> We're working with CEWD and some of the materials that they've developed. We've targeted eight strategic schools based on our hiring needs. We're putting plans in place to be able to go into those schools, pitch energy jobs, and sponsor students who want to start on these career pathways. Duke theoretically could have done this without CEWD, but it would have been much harder, would have taken a lot longer, and working independently is never as effective as working across the industry. I'm not sure we could have gotten to the quality of materials that CEWD has developed in the time they've developed them.

One example of educational materials that CEWD had created was its "Contextualized Math for the Energy Industry" curriculum (see **Exhibit 5**). The curriculum offered nine modules to teach the math skills that a potential employee would need to succeed in the industry. The curriculum was broken down by job category. Categories included lineworker, plant operator, pipefitter/pipelayer/welder, and technician, with each career track getting its own set of problems and competencies to master. The specific problems that students worked on were built around how they would apply their skills in their career. For example, one question in the first module, "Numbers," for lineworkers asked:

> The power line is undergoing an upgrade with new poles and transformers scheduled for installation. Transformer installation brackets come 5 to a box and the maximum number of boxes that a line truck can carry is 4 boxes. What are all the possible number of transformer brackets that a line truck can carry in one trip to the job site?
>
> A. 4, 8, 16, 20 brackets
> B. 10, 20, 30, 40 brackets
> C. 5, 10, 15, 20 brackets
> D. 1, 2, 3, 4 brackets

CEWD Grows and Shifts its Focus

The 2007-2009 recession proved to be a blessing in disguise for CEWD and the utilities industry as a whole. Randazzo explained, "The recession altered everyone's plans. A lot of people who were close to retirement decided to put it off. This allowed the industry to avoid the major retirement bubble we had all been fearing, and gave us more time to build up our pipeline to get more younger talent in."

State consortia Much of the work of implementing CEWD's plans and materials at the state and local level was carried out by state consortia. These were groups of energy leaders in each state that affiliated under CEWD's banner. Randazzo explained, "A state energy workforce consortium is a group of utilities and educators and others in a state that gets together to work on issues relating to the energy industry in that state, much like CEWD does at the national level. They're not chapters of CEWD. We don't tell them what to do. We give them support to work on whatever issues are relevant

to them. They're all volunteers." Early state consortia included Florida, Georgia, Indiana, and a joint consortium between North and South Carolina. CEWD held annual summits of all state consortia members. By 2009, there were more than 20 state consortia, and by 2018 there were nearly 30.

One example of the work of a consortium came from Michigan. Randazzo explained, "In Michigan they have pulled together their training organizations and asked, 'How much of the work we're doing internally could be done in the public education system, and how much of it has to be done specifically because of the differences in our companies?' And they used our competency model as a basis for that."

Focusing on Skills and Diversity

As the recession abated in the 2010s, CEWD's focus shifted. Randazzo explained, "Whereas initially retirement was the biggest issue, now we're seeing it's really more about skills and bringing in a diverse, qualified workforce." Williams referred to diversity initiatives as "an important part of the challenge and opportunity of building the workforce of the future. We want that workforce to reflect the communities we serve, and we see that as a strategic advantage."

CEWD's early work understanding the necessary competencies for different jobs helped the group think through the skills problem. Anderson explained, "CEWD hoped to bring people to the door of the company. Once they're hired, the company takes over on training. Most companies have processes in place; CEWD has created materials that many companies use in their training programs."

Working through the state consortia, CEWD began to interact with community colleges throughout the country. The group built a National Energy Education Network (NEEN), consisting of between 200 and 300 schools that actively partnered with CEWD member utilities on education programs. Randazzo explained, "When we started, we had thousands of schools that said, 'Oh yeah, we teach energy stuff,' but when we began looking at it, they really didn't educate the students for our jobs. We had to start from scratch to look at which schools had a program that would train for our specific jobs."

Working with the education system posed some challenges. Randazzo noted, "If we were starting from scratch with a community college program, we could lay out pretty easily: 'Here's what you teach in the first semester and the second, and so on.' But because of the way the colleges are funded, and the way professors like to develop their own curricula, it's difficult to go into a community college and start a program from scratch based on our materials." Nonetheless, Anderson reported, "We have found that the community colleges are very receptive and very anxious to work with whatever industry is local to them. The utilities industry is local just about everywhere, so a lot of state consortia have taken CEWD materials into their local community colleges." CEWD created a guide that its members could use when attempting to partner with community colleges. The 19-page document explained the academic environment of a typical community college and offered tips for creating programs with community colleges to offer academic credit for professional training experiences.

The more CEWD worked with community colleges, the more the organization saw the need to start working even earlier in the education system. "In order to have a reliable long-term pipeline of talent coming into our industry," Randazzo said, "we needed to work backwards into high schools, middle schools, and even elementary schools." (See **Exhibit 6**.) CEWD expanded its content development to create educational materials that would appeal to students of all ages. For elementary school students, CEWD and some of its state consortia created materials on the basics of energy and electricity—where the power comes from when you turn the lights on, how to conserve energy, and how different types of fuel could create electricity. Middle school materials started to cover circuitry, while high schoolers learned about the physics of electricity, or, in more vocational programs, began to gain some more

specific, job-focused skills. Some state consortia had partnered with science-focused charter schools in their regions, or offered their power plants as sites for school field trips.

CEWD was focused on improving science, technology, engineering, and math (STEM) education throughout the education system. Randazzo noted, "We believe every job we have is a STEM job. It's not just for mathematicians or chemists. There isn't a single job in our industry where you don't need to understand math, or the way the world works scientifically, or how to use technology. STEM is foundational to every one of our jobs." At the national level, CEWD partnered with some STEM education organizations to excite students. In 2015, CEWD began a partnership with First Robotics. First Robotics sponsored robot building events at middle and high schools throughout the country. Randazzo explained, "First Robotics is an incredible organization. Teams get together to create robots, but it's not just about the robots. They learn team building, problem solving, and critical thinking. Getting kids excited about building things and solving problems is exactly what we need to be doing to get them excited about our jobs." CEWD also partnered with SkillsUSA, a national organization founded to advance career and technical education in America's schools. The SkillsUSA/CEWD partnership led to the creation of an "Energy Industry Employability Skills Certificate" that students could earn by proving competency in a range of energy-related topics. The certificate was aimed at high school and college students.

At the same time, CEWD was working to improve the diversity of its talent pipeline. Reese explained, "If you don't have diversity in the education pipeline, then the chance of finding it when you're recruiting is pretty slim. It seems like a simple thing, but it's something we have spent time focusing on. What we tell companies is, 'If you're having difficulty finding skilled, diverse applicants, then look in the classrooms and see if they're diverse. If they're not, then that's where you have to go to work.'" Reese continued, "Racial diversity is crucially important. We have to build workforces in every community in the country, and we want those workforces to look like those communities. If people of color feel like these jobs are closed off to them, there are many communities with large immigrant populations, or large African American populations, that we're just not going to be able to fill all our jobs. We're working hard to avoid that problem." Randazzo added, "We're going to need workers 10 years from now, so if we aren't thinking about skills and diversity now, then we'll be in the same kind of circular situation that we've been in for the last 12 years. The students who were in elementary and middle school when CEWD was founded are now in the workforce." CEWD also considered its work with veterans to be an important diversity initiative.

One focus of CEWD's diversity push was to get more girls interested in STEM subjects and energy jobs. Randazzo explained that it was particularly important to start early:

> Girls make decisions very early about whether they are going to be interested in science and math. They lose confidence sometimes as early as elementary school. Then as they progress through school, they don't take the science and math courses they'll need. So they get behind, and they can't make it up, and then our jobs get closed off to them. We don't want that. In other cases, there is the perception among girls or young women, whether it's real or imagined, that they physically couldn't do our jobs—they couldn't climb a pole, or lift heavy cables. That also makes our applicant pool more limited.

CEWD Preparing for the Future

In 2016, for its 10 year anniversary, CEWD underwent a review of its work and engaged in a strategic planning effort. The review was led by CEWD's board of directors and executive council. The result of the review was a report on the "Game Changers" that would be affecting the energy industry

over the next decade. Game changers were categorized as external factors or internal factors. External game changers included infrastructure modernization, a cleaner energy mix, building new infrastructure, changing regulations and policies, and improving physical and cybersecurity. Internal game changers included the industry's aging workforce, consolidation, strategic workforce decisions, adoption of new technology, and affordability within companies. CEWD examined how each of these game changers would impact the workforce needs of the industry (see **Exhibit 7**). The organization then examined the programs it had in place, and how well they were preparing the companies of the utilities industry to face these game changers.

The report closed with a series of recommendations for companies, educators, state consortia, and CEWD member associations (see **Exhibit 8**). For its part, CEWD pledged to:

> Build the alliances, processes, and tools to:
>
> - Ensure companies and state energy workforce consortia are equipped to develop sustainable workforce plans that balance the supply and demand for a qualified and diverse energy workforce.
> - Create awareness among students, parents, educators, and non-traditional workers of the critical need for a skilled energy workforce and the opportunities for education that can lead to entry-level employment.
> - Implement clearly defined education solutions that link industry-recognized competencies and credentials to employment opportunities and advancement in the energy industry.
> - Organize the energy industry workforce development efforts to maximize the effectiveness of national, state, and individual company initiatives.[18]

There was reason to believe that CEWD would not have trouble implementing its plans industry-wide. By 2017, CEWD members, including IOUs, municipals, and cooperatives represented almost 85% of all the employees in the industry (see **Exhibit 9**). Industry association members had grown to include the National Rural Electric Cooperative Association, the American Public Power Association, and the Distribution Contractors Association in addition to EEI, NEI, and AGA. Randazzo noted that these associations were key because they built executive buy-in:

> What happens frequently is that you might end up with somebody in HR who sees the need to get involved in this work, but it can be difficult for someone in HR to pull together everyone in their company to sit down and do it. It takes executive involvement. That's where our work with the trade associations becomes so important, because that gives us a voice to the CEOs to be able to explain what we're doing and how their company can get involved and help.

As a result of the strategic review, the board saw a real need to include supplemental labor contractors in the work of the CEWD. Contractors joined CEWD in 2017. Randazzo explained:

> We probably have twice as many contractors involved in projects as we do full time employees of utilities. When we're talking about talent, we have to consider contractors in the mix. But at the same time, contractors are competing with one another in a way that utilities are not. They're bidding for jobs against each other. In our 2016 review, we saw the impact of contractors growing and continuing to grow into the future.

Reese noted that the five contractors and the contractor association that joined CEWD saw it as a friendly organization for them. "We've invited contractors to participate in a lot of what we've done. In conversations with them, we discovered that they were facing a lot of the same problems with workforce development that utilities were encountering. We offered the materials that we had developed for them to use, and they decided it would be a good idea to join the organization and participate in the conversation in a larger way."

An Industry Forum

One particular advantage of CEWD's work became clear to the executives who were part of the organization over the years. Williams, PG&E's CEO, explained, "CEWD is a great platform for sharing best practices. Whenever we get together, we talk about what works, what didn't work, what we've learned, and who we've partnered with. It extends the already strong sense of collaboration in our industry. It's in the nature of our industry to work together to solve big problems."

Reese, of Southern Company, added that having CEWD as a forum for workforce conversations made it easier to tackle those issues within a company. She said, "One of the things we're beginning to see more of is a focus on pulling together within a company of all the different people who touch the talent pipeline. We've realized that everyone needs to be on the same page or we won't get anything done, and CEWD has helped with that."

What to Do Next?

Reflecting on CEWD's first dozen years, Randazzo said:

> We saw CEWD as a five-year effort. At that time we thought, "How hard can this be?" What we've found since then is that it's not a short term project. We have learned so clearly that you have to be in it for the long term because you're *growing* a workforce. It has to be grown locally. It's not the kind of thing where you put the word out to some university or community college to send some people. We had to start from scratch in terms of all of the work to get students in the lower grades to understand what they need to do and the importance of STEM skills and technical skills and really be able to grow that all the way through high school to community colleges and university. And it's not a one and done. We have to continually nurture it.

The problem of the retirement bubble had been weathered (see **Exhibit 10**). With near universal buy-in from the utilities industry, Randazzo believed that CEWD could do much more to help prepare younger and more diverse applicants to enter the industry. Perhaps the time had come to provide more value to members by insisting that they subscribe to industry standards in terms of curricula and credentials. Randazzo mused:

> Every year, as long as we keep our members happy and satisfied, they keep funding us. In the last 12 years we've created things that they find useful, that they can adapt. But given how few members have actually used what we created, in the last couple years we've slowed down on creating toolkits. We are constantly discussing metrics with the board but we don't collect enough data. I know we've had an impact, but I can't tell for example how many veterans have been hired by utilities because of CEWD's efforts. As we look at the next decade, what should we do to make CEWD more effective in closing the skills gap, improving the diversity of workforce, and preparing for the onslaught of technology?

Exhibit 1 CEWD 2018 Goals

Vision Where the industry speaks with one voice for a single purpose—Companies adequately staffed with a diverse workforce with the skills to safely keep the energy flowing.

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

Workforce Planning Identify critical workforce needs and measure the success of workforce development initiatives

- Update the National Energy Strategic Workforce Plan and Game Changers.
- Facilitate the Workforce Analytics Task Force and add key focus areas such as non-retirement attrition.
- Work with CEWD members to identify solid methods/strategies to improve retention in critical key jobs and publish applicable tools, resources, and best practices.
- Broaden the knowledge transfer taskforce to launch and implement the Community of Practice and publish findings, tools, resources, and best practices.
- Prepare for the 2019 Gaps in the Energy Workforce survey to include contractor workforce demand, improved reporting, and additional demographic data.
- Provide support to member companies to implement the CEWD Strategic Workforce Planning process.
- Provide support to State Energy Workforce Consortia in the development of state strategic plans to include state level supply/demand data.

Career Awareness Build awareness of high skilled positions in the energy industry

- Transition Get Into Energy Youth to GIE/Get Into Stem to include a modernized website and tools/templates for increasing career awareness among youth.
- Implement a coordinated energy careers image campaign with member associations
- Expand Troops to Energy jobs tools to make it easier for veterans and recruiters to connect and to understand the skills and training veterans bring to the workplace.
- Support member implementation of Get into Energy career awareness tools for youth, women, military, and transitioning adults.

Workforce Development/Education Implement short and long term solutions to build a pipeline of skilled workers

- Develop and communicate a Diversity and Inclusion National Template based on the Making a Connection to a Diverse, Qualified Pipeline assessment tool and playbook.
- Increase the use of Get Into Energy Career Pathways credentials and resources by working with member companies to recognize GIE credentials in the recruiting process.
- Provide support for National Energy Education Network (NEEN) members; identify and share examples of successful practices.
- Build awareness among educators of how to best leverage funding sources to support student completion of energy pathway programs.
- Implement a new Legacy I3 credential to include employability skills, EIF, and OSHA-10.
- Update instructor and student guides for Energy Industry Fundamentals curriculum.
- Repackage EIF modules for use with an expanded audience, such as orientation for new company employees or bootcamps for transitioning workers.
- Support members and collect data for using the GIE Math and Test Prep Workshop to maximize pass rates on candidate pre-employment tests.

Member Value and Support Support the needs of CEWD members

- Provide support for State Energy Workforce Consortia and increase knowledge sharing across regions.
- Provide focused support for contractors and international CEWD members and promote solutions and partnerships for their unique workforce issues.
- Expand and manage CEWD Communities of Practice.
- Develop and implement a guided assessment and planning tool to assist members with focused implementation of CEWD's tools and resources.
- Provide consultation and support to members on best practices, trends, and tools to support their workforce development implementation efforts.
- Conduct the 2018 Annual Summit, National Forum, NEED Convenings, and Regional Meetings.
- Create mutually beneficial alliances with organizations that support and advance CEWD initiatives.

Source: Company documents.

Exhibit 2 CEWD Funding Model

- The administrative budget of CEWD is funded by member contributions.
- Initiatives are also funded through federal/state and foundation grants and/or corporate contributions and from other sources, such as meeting fees.
- The energy company member contribution schedule is as follows:
    - More than 15,000 employees - $30,000
    - 10,000-14,999 employees - $25,000
    - 7,500-9,999 employees - $18,750
    - 5,000-7,499 employees - $12,500
    - 2,500-4,999 employees - $6,500
    - 1,000-2,499 employees - $3,500
    - 101-999 employees - $1,250
    - Under 100 employees - $750
- The utility association member contribution schedule is as follows:
    - National association contributions are negotiated
    - Regional associations - $6,500
    - Local/State associations - $1,250
- The contractor member contribution schedule is as follows:
    - More than $1 billion in U.S. revenue - $30,000
    - $500 million-$1 billion - $25,000
    - $300 million-$499 million - $18,750
    - $100 million-$299 million - $12,500
    - $50 million-$99 million - $6,500
    - $10 million-$49 million - $3,500
    - $1 million-$9 million - $1,250
    - Less than $1 million - $750

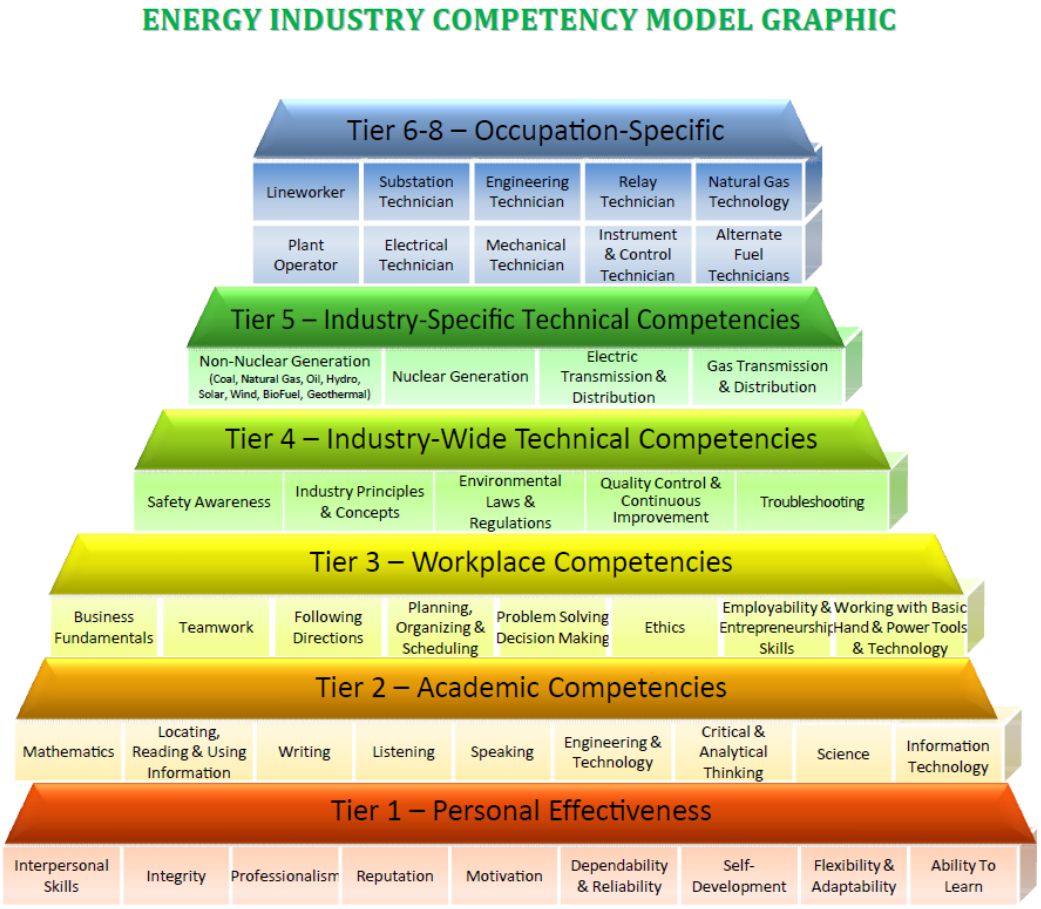
Source: Company documents.

Exhibit 3 Average Wages for Select Jobs in the Utilities Industry, 2016

Job	Wages, 2016			
	Hourly		Annual	
	Median	Mean	Median	Mean
Control and valve installers and repairers, except mechanical door	$32.12	$31.91	$66,820	$66,370
Electrical engineers	$44.88	$45.66	$93,350	$94,980
Electrical power-line installers and repairers	$35.24	$34.98	$73,310	$72,760
First-line supervisors/managers of mechanics, installers, and repairers	$43.67	$42.60	$90,820	$88,610
Meter readers, utilities	$22.55	$22.95	$46,890	$47,730

Source: Casewriter adapted from Bureau of Labor Statistics, "Industries at a Glance: Utilities," https://www.bls.gov/iag/tgs/iag22.htm, accessed January 2018.

Exhibit 4 Competency Model



Source: Company documents.

Exhibit 5 Energy Industry Contextualized Math Modules

What is contextualized math?

Contextualized learning is not something new. Back in 2001, the United States Department of Education Office of Vocational and Adult Education characterized CTL as a "conception of teaching and learning that helps teachers relate subject matter content to real world situations." These instructional strategies are designed to more seamlessly link the learning of foundational skills and academic or occupational content by focusing teaching and learning squarely on concrete applications in a specific context that is of interest to the student.

How does it improve students' understanding of math concepts?

How many of us sat in high school algebra wondering, "Why do I need to know this? I'll never use it in real life." In most cases, we're not provided any type of context or real world application. Research supports the fact that students understand math better when it is contextualized. It motivates and increases the students' willingness to engage and provides concrete meaning to the math.

How do I use the modules?

It is important to note that students need to engage in three steps BEFORE providing any type of contextualized math problems:

1. Develop a conceptual understanding.
2. Make connections to why they need to know the content.
3. Be fluent in the procedures of how to do the math problems.

If math concepts are taught in context first, students have difficulty using the math outside of the specific contexts presented. So the energy industry contextualized math problems should be used after students have gone through steps one through three for each topic.

What math concepts are covered?

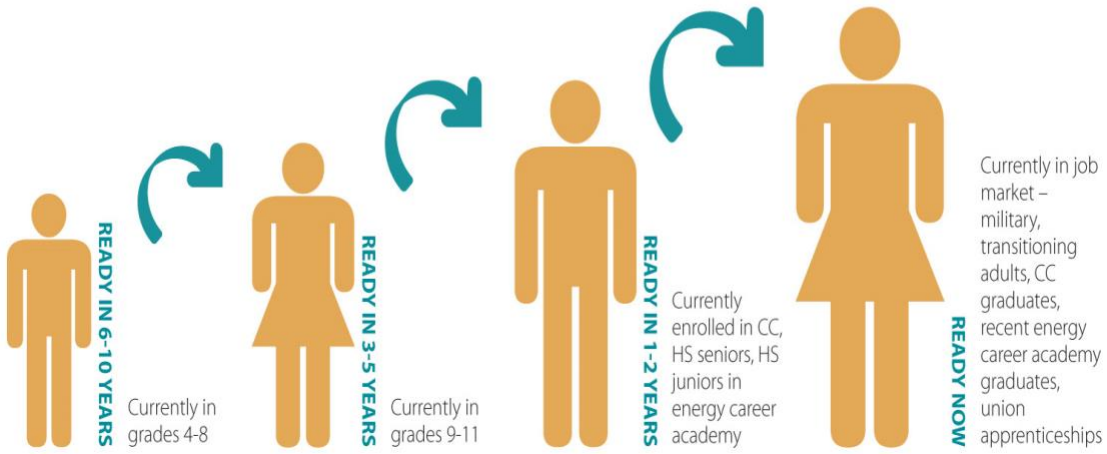
- Basic operations
- Forms of fractions
- Operations with fractions
- Converting fractions to percentages
- Ratios and proportions
- Conversions (English and metric)
- Use of formulas

Why were these math concepts selected—aren't these concepts taught in middle school?

The selected topics are those that are covered on pre-employment tests in the energy industry. The modules don't provide direction on how to teach the concepts—only word problems that use concepts. All of the questions in the modules are presented in the context of specific occupations so students not only learn better, but they gain awareness of careers in the energy industry.

Source: Company documents.

Exhibit 6 CEWD Long Term Workforce Planning



Source: Company documents.

Exhibit 7 Workforce Impacts of Utilities Industry Trends

Engineers	Lineworkers	T&D Technicians	Generation Technicians	Plant/Field Operators	Contractors
Infrastructure Modernization					
High Impact	Medium Impact	High Impact	Low Impact	Low Impact	Medium Impact
Cleaner Energy Mix					
High	Low	Low	High	High	High
New Build					
High	Low	Low	High	High	High
Physical/Cyber Security					
High	Medium	Medium	Low	Low	High
Aging Workforce Impact					
Medium	Medium	Medium	High	High	High

Source: Company documents.

Exhibit 8 CEWD "Game Changers" Recommendations, 2016

What Companies Can Do:

- Make it easier for students and job seekers to find us, understand our jobs, and learn what education pathways in your region will lead to an energy job.
- Signal to students, jobseekers, and educators which credentials are required, preferred, and recognized by employers in your state, and are being used in hiring decisions.
- Develop partnerships with other employers and educators to engage students from interest through employment.
- Organize and educate within your company to communicate strategies, initiatives, policies, and funding and align company personnel, systems, policies, and practices to support the needs of diverse, qualified applicants.
- Provide data on the timing and demand for jobs in your company and feedback to educators and pipeline organizations on the quality of hires from their organizations.

What Educators Can Do:

- Conduct bootcamps at every stage of the pathway for concentrated skill development.
- Accelerate the time it takes a student to earn his/her credential by recognizing prior training.
- Focus on the common denominator, by organizing programs of study around core essentials first and then technical competencies.
- Bundle curriculum with transferable certificates and stackable credentials that integrate industry-recognized credentials into energy programs of study.
- Provide industry partners with supply data on students in the pipeline.

What State Energy Workforce Consortia Can Do:

- Develop and maintain a state energy workforce plan to steer industry-led workforce efforts.
- Build state awareness of the need for a skilled energy workforce and awareness of energy careers among targeted populations.
- Implement core curriculum across schools to enable easier transfer of credits and faster graduation of students with needed skills.
- Assess the impact of energy workforce needs on the state's workforce policy and communicate to consortium members and partners.
- Create mutually beneficial alliances with organizations that support and advance the consortium's initiatives.
- Maintain the consortium as a self-sustaining operating structure that includes governance, management, and financial processes.

What CEWD Member Associations Can Do:

- Convene: Use member convenings to engage associated organizations and ensure there is alignment, integration, and a shared understanding of industry workforce issues and what is needed to address them.
- Advocate: Be advocates for industry workforce efforts and policy issues at both the company and the national government level.
- Communicate: Ensure a vocal presence in the Nation's Capital for energy industry workforce issues; share workforce successes within the industry; create integrated teams of legislative and communications representatives.
- Provide heightened focus on employee processes and systems that are most critical to workforce development and knowledge transfer, including human resources policy, compensation and benefits practices, and succession planning.

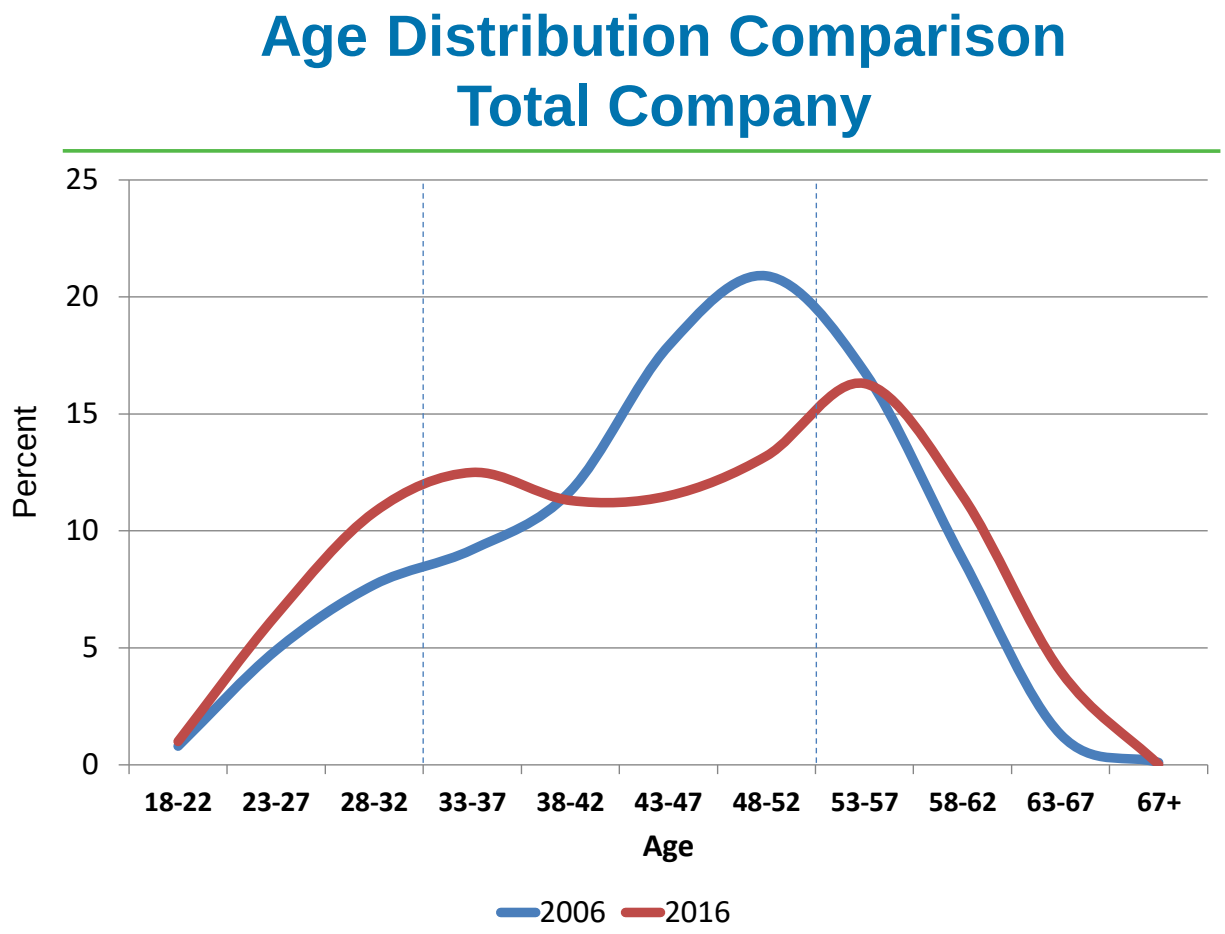
Source: Company documents.

Exhibit 9 CEWD Member Organizations, 2018

ALLETE	Alliant Energy	American Gas Association
Ameren Corp.	American Electric Power	American Public Power Assoc.
American Transmission Co.	AREVA	Arkansas Electric Coop. Assoc.
Arkansas River Power Auth.	Arizona Public Service Co.	Assoc. of Illinois Electric Coops
AVANGRID Inc.	Avista Utilities	Bandera Electric Coop.
Berkshire Hathaway	Black Hills Corp.	Central Hudson Gas & Electric
Central Iowa Power Coop.	CHELCO	Cleco Corp.
Coast Electric Power Assoc.	Colorado Springs Utilities	Consolidated Edison, Inc.
Consumers Energy	Dayton Power & Light	Distribution Contractors Assoc.
Dominion	DTE Energy	Duke Energy
East Kentucky Power Coop.	Edison Electric Institute	ElectriCities of North Carolina
Electric Cities of Georgia	Energy Northwest	Entergy Corp.
Eugene Water & Electric Board	Eversource Energy	Exelon Corp.
FirstEnergy Corp.	Gainesville Regional Utilities	Great River Energy
GreyStone Power	Indianapolis Power & Light	InfraSource
ITC Holdings	JEA	Kansas City Power & Light
Lakeland Electric	Large Public Power Council	Lincoln Electric System
Madison Gas & Electric Co.	MASTEC	Midwest Energy Assoc.
Michels Corp.	Montana-Dakota Utilities	Mt. Carmel Public Utility Co.
National Grid	National Rural Electric Coop. Assoc.	Nebraska Public Power District
New Jersey Resources Corp.	New York Power Auth.	NextEra Energy, Inc.
NiSource	North Carolina Electric Membership Corp.	NorthWestern Energy
Nuclear Energy Institute	OGE Energy Corp.	Omaha Public Power District
Oncor Electric Delivery Co.	Otter Tail Power Company	Owen Electric Coop.
Pacific Gas & Electric Co.	Pedernales Electric Coop.	Philadelphia Gas Works
Pike Enterprises	PNM Resources	Portland General Electric
PPL Corp.	Premier Power Maintenance	SCANA Corp.
Sempra Energy Utilities	Public Service Enterprise Group	South Jersey Industries
Southern California Edison	Sacramento Municipal Utility District	Southern Company
Southwest Gas Corp.	South Texas Proj. Nuclear Operating Co.	Spire
Sunflower Electric Power Corp.	Tacoma Power	TECO
Tennessee Valley Auth.	The Oglethorpe Family of Cos.	UGI Utilities, Inc.
UNS Energy Corp.	Tri-State Gen. & Trans. Assoc.	Vectren Corp.
Wabash Valley Power Assoc.	VA, MD & DE Assoc. of Electric Coops.	Washington Gas Light Co.
WEC Energy Group	Westar Energy	Wolf Creek Nuclear Op. Co.
Wyoming Rural Electric Assoc.	Wisconsin Electric Coop. Assoc.	Xcel Energy, Inc.

Source: Company documents.

Exhibit 10 Age Distribution in the Utilities Industry, 2006 versus 2016



Source: Company documents.

Endnotes

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