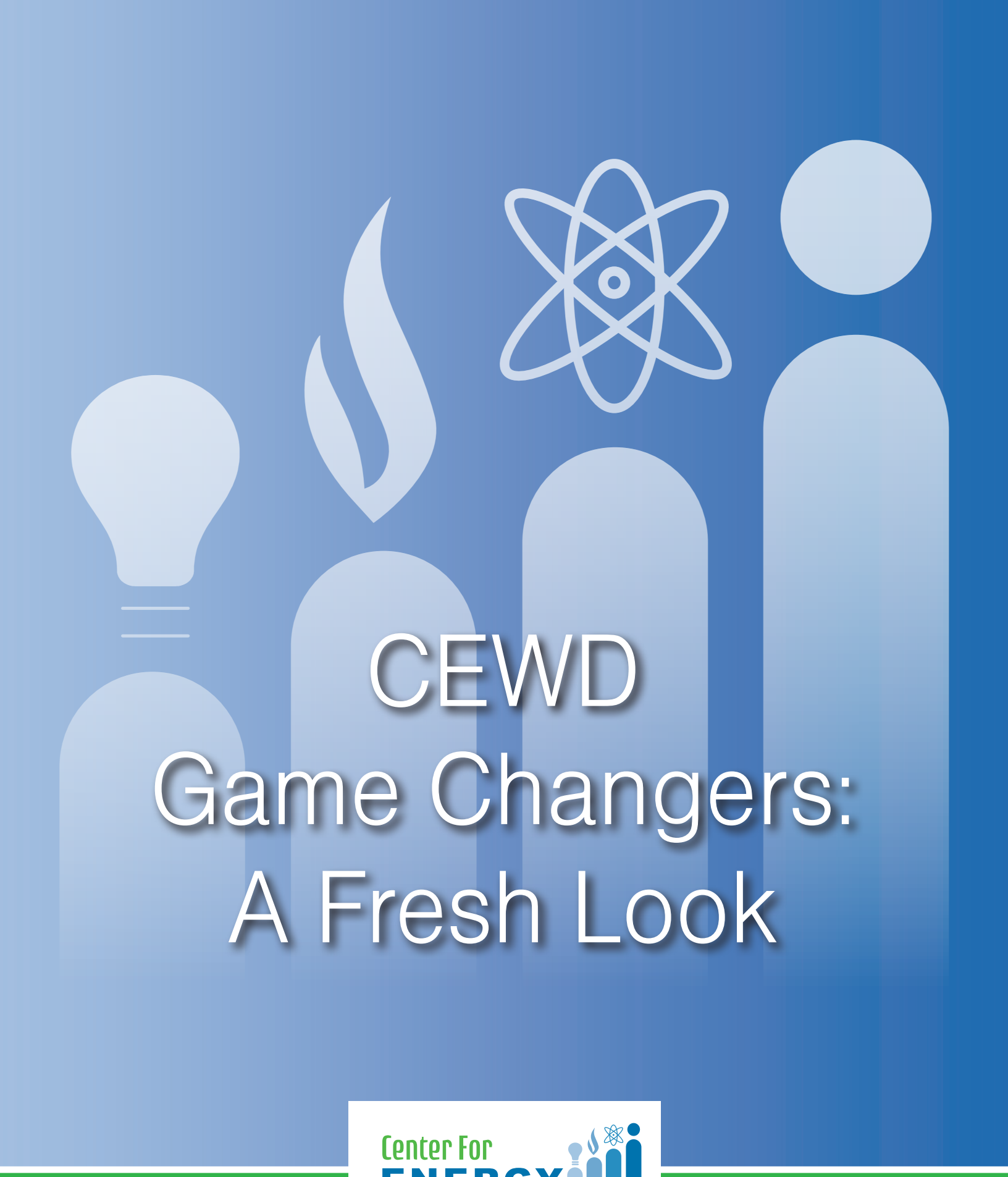

CEWD Game Changers: A Fresh Look

Center For ENERGY Workforce Development

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CEWD Game Changers: A Fresh Look

An important outcome of the CEWD Board of Directors and Executive Council planning session in March 2016 was review and feedback on the "Game Changers" that impact the energy industry. Industry Game Changers have been part of CEWD's lexicon for many years and represent the potential for significant shifts in size, skills, and knowledge requirements of the current and future energy workforce, all of which can impact companies' abilities to create and maintain a talent pipeline of qualified and diverse workers.

Just as energy companies are balancing the mix of generation and delivery of energy between centralized and distributed resources, today's energy workforce is beginning to mirror that same trend. Although the centralized workforce is decreasing, the work is being distributed to a larger decentralized workforce. In the last decade, the overall number of employees in the Electric and Natural Gas Utility Industry has declined, with the biggest contributor to the overall job decline in back office and corporate jobs. Key Jobs—Lineworkers, Technicians, Plant/Field Operators, and Engineers—represent 44% of the energy workforce; these jobs have remained steady and are close to pre-recession numbers. However, the overall size of the energy industry appears to be growing as companies that provide supplemental labor, specialized expertise, renewable and distributed generation, energy efficiency, and new technology grow.

Based on feedback from Board and Executive Council members, CEWD reviewed the Game Changers and noted a number of areas where revisions are warranted. The revised list of Game Changers continues to be sorted by external factors and internal factors, and each may imply multiple risks based on job function, including generation, transmission, distribution, or corporate support, as well as geography.

Pace and timing are also critical factors for each of the Game Changers; balancing the supply of qualified workers with specific demand becomes one of the most difficult aspects of workforce development. The goal is to have the right number of workers with the right skills at the right time and in the right place. Some companies that are in the midst of infrastructure changes, building or closing plants, or expansion of transmission lines may have pressing current workforce needs. Others may be planning changes in operations that will not be fully implemented for 5 to 10 years and that can make a tremendous difference in determining when new skills are needed.

It's also important to think about the workforce risks and implications of some of the Game Changers through two lenses: **size impact** and **knowledge and skills impact**:

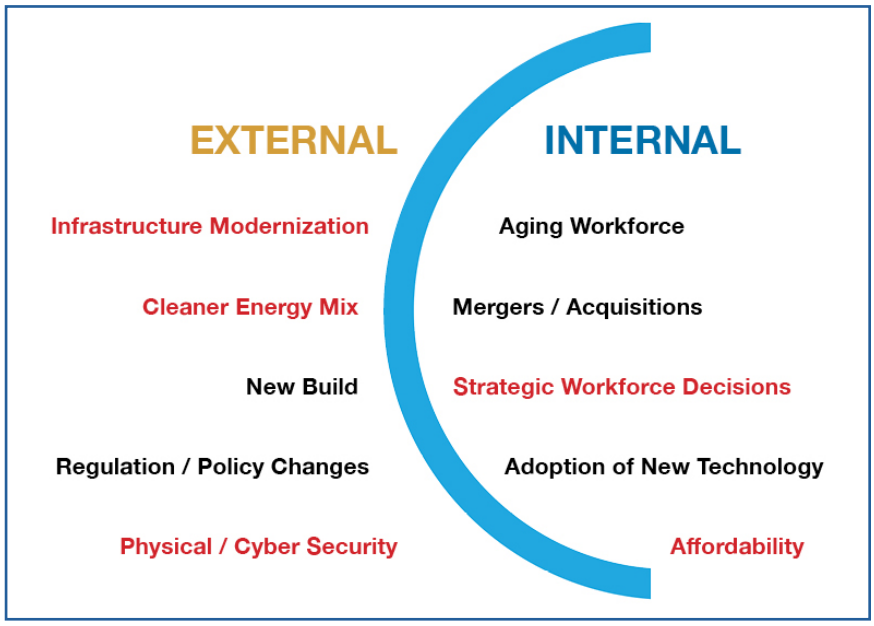
- The size of the workforce and whether it is likely to increase, decrease, or stay the same.
- The knowledge and skills impact and whether new skills will be gained through training internal to the company or externally through an education provider.

For some of the Game Changers, the impact on workforce will depend on the strategy of an individual company or state. For these Game Changers, which include *Regulation/Policy Changes*, *Mergers/Acquisitions*, *Strategic Workforce Decisions*, *Adoption of New Technology*, and *Affordability*, workforce implications and risk must be assessed at the company or region level. For those areas where national implications can be inferred, the following paragraphs summarize the combination of size and skills impacts and provide a guide for focusing on job categories at the national level.

In conclusion, CEWD has attempted to gauge which job categories are potentially most at risk for workforce skills impact. While the focus continues to be on the Key Jobs categories, the assessment addresses other jobs that may be impacted.

Industry Game Changers

CEWD Board of Directors
Revised 2016



"Pace and Timing"

External Game Changers

Infrastructure Modernization (previously Grid Modernization)
Grid modernization is still a significant Game Changer for the electric utility industry. The structure and operation of distribution systems will change as smarter infrastructure is built and new distributed generation technologies, including microgrids, are deployed and integrated into the electric grid. Investing in a safe and reliable power grid is critical to the deployment of new technologies. With these new technologies comes the growth in customer innovation and expectations, and the need for individualized customer solutions to meet the needs of this new generation of customers.

For gas utilities, the growing demand for natural gas driven by low gas prices is outpacing the interstate transportation and distribution systems across the country. Safety and reliability are paramount for the natural gas industry, and an aging infrastructure is drawing attention to the need to modernize the existing infrastructure and build new infrastructure to deliver natural gas. Reflecting the growing demand for gas, 37 states have adopted or considered innovative expansion proposals for the natural gas system.

Infrastructure modernization has significantly changed the forecast for jobs in some segments, like gas transmission and distribution. The need for workers is increasing but contractors are also struggling to attract enough skilled workers to get the work done that is needed by the utilities. Even engineering firms are struggling with getting the right engineers with the skills needed.

New digital technology in particular is impacting workforce size as a smarter grid may mean fewer employees to operate the grid, but a greater number to research, design, build, and protect the new technologies. Drone technology is a good example of how the job mix changes. Although the use of drones reduces the time and manpower to inspect lines, the number of workers shifts to those who design, build, operate, and maintain the drones.

Infrastructure Modernization also has significant impact on workforce skills, not only for industry members but for their contractor partners. As the focus on modernizing the current infrastructure continues to grow, industry members and their partners must work together to address shared workforce needs for new skills associated with the two-way flow of electricity, telecommunications, networking, and distributed energy.

Engineers have a huge role to play in modernizing our energy infrastructure. The need for degreed engineers to design new infrastructure is only expected to grow and the skill requirements are changing. The need also precedes other jobs as engineers are needed to design the work before it can be built. In addition, the results of the CEWD Gaps in the Energy Workforce Pipeline Survey show a significant decrease in the number of mid-career engineers, which may reflect a knowledge risk as older engineers retire and new engineers enter the workforce.

Considering the total impacts of Infrastructure Modernization as a Game Changer, the two Key Job classifications of highest concern are Engineers and T&D Technicians; even though workforce attrition appears to have stabilized for Lineworkers, medium impacts are also expected with the ramp-up of planned replacement of transmission and distribution infrastructure. Impact on the Contractor population is also high.

Infrastructure Modernization Impact

Engineers	Lineworkers	T&D Technicians	Generation Technicians	Plant/Field Operators	Contractors
High	Medium	High	Low	Low	High

New Build

Building new energy plants, including new nuclear, gas pipelines, and transmission lines, continues to have strong implications for workforce development efforts. In addition to modernizing our existing gas pipelines, new pipelines need to be and are under development to get gas to the markets throughout the East, Southeast, and Midwest. External pressures for cleaner energy sources, growing energy demand, and stronger economic conditions drive new plant construction, in turn driving job growth, particularly in the gas and electric transmission and distribution segments. Construction of new infrastructure will have impacts for Engineers and Contractors, as well as for Generation Technicians and Plant/Field Operators to operate and maintain the new plants.

New Build Impact

Engineers	Lineworkers	T&D Technicians	Generation Technicians	Plant/Field Operators	Contractors
High	Low	Low	High	High	High

Cleaner Energy Mix (previously Generation Mix/Carbon Management)

Utilities are making significant investments to transition to a cleaner energy mix by expanding the use of gas, hydro, new nuclear, and renewable generation sources, and by improving energy efficiency. This move towards the industry's goal of reducing its use of carbon-based fuels includes coal plant retirements or retrofits and maintains the industry's commitment toward safe, reliable, clean, and affordable energy.

The shift to cleaner energy sources is also having an impact on the number of utility workers in generation. For example, companies are redeploying workers from retired coal plants to new gas facilities, but fewer numbers are required to operate those new plants. Although attrition and retirements may negate some of the reductions, this new internal pipeline of experienced workers is beginning to reduce the number of graduates needed from community colleges and technical programs.

Engineers, Generation Technicians, Plant/Field Operators, and Contractors are most impacted by the changes to a Cleaner Energy Mix. As older plants close and new generation facilities are built, skill requirements, workforce size, and geography must all be considered for degree of impact.

Cleaner Energy Mix Impact

Engineers	Lineworkers	T&D Technicians	Generation Technicians	Plant/Field Operators	Contractors
High	Low	Low	High	High	High

Physical/Cyber Security (New Game Changer)

Cyber security is essential for all types of critical infrastructure. Securing the nation's energy infrastructure has grown increasingly more complex as physical threats have increased globally and reliance on technology has subjected the industry to complex cyber security risks.

While it's unlikely that a large number of physical and cyber security jobs are going to be created by the industry, the issue is less about numbers and more about adequate coverage and industry-specific expertise. From the bottom to the top of the organization, all employees should have some form of cyber security training. The industry can't afford not to have their employees adequately trained and aware of cyber threats, in the control rooms and beyond. The potential for cyber and physical threats and appropriate actions must be understood by all employees and become part of the culture, much like the industry's focus on safety. Energy companies are also making organization changes that reflect this heightened focus on cyber and physical security by combining organizations.

Some jobs need specific skills upgrades to protect infrastructure while in other cases, companies use expert consultants. Some companies are segmenting Information Technology (IT) and Operational Technology (OT) since OT requires different skill sets. Industrial Control Systems, including supervisory control and data acquisition (SCADA) systems and distributed control systems (DCS), are at the heart of infrastructure modernization and will require increasingly energy-specific skills to keep both the electric and gas grids safe.

As is common for other external Game Changers, the impact of physical and cyber security needs is expected to be highest for Engineers and Contractors.

Physical/Cyber Security Impact

Engineers	Lineworkers	T&D Technicians	Generation Technicians	Plant/Field Operators	Contractors
High	Medium	Medium	Low	Low	High

Regulation/Policy Changes

The full impact of energy regulation and policy hinges in part on whether the Clean Power Plan is enacted, but federal and state regulatory mandates continue to influence energy companies' priorities and the workforce plans that support them.

For this Game Changer, the timing and scope of change will remain unknown. The question quickly becomes: how does the industry forecast workforce needs in the midst of uncertainty knowing that the risks are so high? And what strategies can we put in place now to mitigate the risks? The predictability of hiring requirements and opportunities is key to having a skilled workforce. Strategic workforce planning can significantly mitigate the financial, knowledge, safety, and timing risks of this and other less predictable Game Changers.

Internal Game Changers

Aging Workforce

In 2015, CEWD conducted the sixth "Gaps in the Energy Workforce Pipeline" which again focused on the four Key Job categories that are considered critical to the industry: Lineworkers, Technicians, Plant/Field Operators, and Engineers. Overall, the workforce is getting younger, with Lineworkers, Engineers, and Nuclear Operations being the youngest of the surveyed jobs. Hiring has increased, particularly in the 23–38 age group, and a little over half of the hires reported were in Key Jobs, with almost 20% of all hires in the Lineworker category.

At the same time, the number of older workers has declined as workers in Key Jobs are retiring, with retirement forecasts in future years trending downward for the first time since CEWD began surveying. The non-nuclear generation workforce, specifically Technicians and Non-Nuclear Operators, show the largest number of employees still eligible to retire. Generation Technicians are also the most at risk for retirements, and potential generation shifts have caused many Technicians to delay retirements.

Although the most recent survey results show progress in replacing a generation of aging workers in nearly every category, significant gaps still exist for Engineers and Technicians. And some segments of the energy industry have been more successful than others in catching up to the age curve. Geography and generational differences can play a significant role. In small, more rural areas, IOUs, municipalities, and co-ops struggle with attracting talent and replacing the expertise lost with retiring workers. And the competition for talent can be significantly different depending on the location and type of skills needed. With a more diverse workforce that includes younger employees, a more diverse ethnic mix, and new employees with different backgrounds, energy companies are targeting their career awareness efforts and focusing on inclusion and retention strategies to ensure sustainability in a continually changing workforce.

Overall, the aging of the energy workforce continues to make the list as a significant Game Changer for the industry that must be factored into workforce hiring and development strategies.

Aging Workforce Impact

Engineers	Lineworkers	T&D Technicians	Generation Technicians	Plant/Field Operators	Contractors
Medium	Medium	Medium	High	High	High

Although much has been done to analyze the impact of the aging workforce, the size and skills impacts of other Internal Game Changers are more difficult to assess at a macro level because—with the exception of an aging workforce—they are most often driven and influenced by company-specific decisions.

Mergers/Acquisitions

Mergers among energy companies and acquisitions of businesses that complement or broaden an energy company's portfolio continue to drive significant changes internally. If the merger or acquisition includes expansion of geographic service territory, workforce impacts may be larger for corporate functions than for Key Jobs.

Strategic Workforce Decisions (previously Significant Organization Decisions)

Strategic decisions may have profound changes on a company's workforce size, demographic makeup, skill sets, and knowledge. Those decisions can encompass a focus on increased diversity, veteran hiring, in-sourcing previously out-sourced talent, centralizing, de-centralizing, or combining organization functions, or efficiency initiatives. At the national level, the industry has made a commitment to train, hire, and retain military veterans (Troops to Energy Jobs) that is having a real impact on company practices. In addition, the national industry focus on improving diversity and inclusion is driving education and workforce decisions.

Some Strategic Workforce Decisions, like outsourcing or insourcing a particular job category, may have an impact on the size of the workforce. But more than likely, they will impact the demographics or distribution of the workforce. For example, the national focus on hiring military veterans may decrease hiring from other sources like community colleges.

Adoption of New Technology

Technology changes inside an energy company occur frequently as companies work to keep pace with technology affecting all aspects of the business. These changes may require training or expansion of the existing workforce.

Affordability (New Game Changer)

Balancing workforce needs with reductions in labor budgets is a critical issue for companies as both internal and external cost pressures continue in the industry. External drivers, like those already mentioned, drive company priorities and, subsequently, budgets. Each company must determine what it can afford in the way of workforce strategy, given internal resources and budgets. The issue of affordability is apparent when companies make "build, buy, or borrow" decisions in addressing workforce needs and has a specific impact on financial risk.

Affordability goes hand-in-hand with Strategic Workforce Decisions as energy companies find ways to perform work more efficiently. As an example, individual municipal utilities may not have the resources to hire full-time talent in some areas, so groups of public power utilities have formed Joint Action Agencies to share workers between companies, or to provide specialized services. The agencies function less like contractors and more like centralized corporate services in larger energy companies.

Impact Summary

In summary, the anticipated impacts to Key Jobs by the five referenced Game Changers paints a compelling picture for heightened focus on Engineers and Technicians and a new concentration on the Contractor workforce and on physical and cyber security needs.

Engineers	Lineworkers	T&D Technicians	Generation Technicians	Plant/Field Operators	Contractors
Infrastructure Modernization					
High	Medium	High	Low	Low	Medium
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

The Industry Response

Over the past 10 years, the Electric and Natural Gas Utility Industry has been actively engaged in the development of critical talent pipelines to address the transforming demographics and business needs of the industry. In 2006, the industry united to form the Center for Energy Workforce Development (CEWD), whose members now include all five major utility trade associations (Edison Electric Institute, American Gas Association, Nuclear Energy Institute, National Rural Electric Cooperative Association, and American Public Power Association); most of the electric and natural gas utilities across the country; unions (IBEW and UWUA); and partners in the effort, including educational institutions and government entities.

Up to this point, the industry has focused on four key talent pipelines: Lineworkers, Technicians, Plant/Field Operators, and Engineers—and has built partnerships at the local, state, and national level to implement these pipelines. Each of these talent pipelines has different educational requirements but are built on a common process. The process starts with the definition of talent needs, including workforce demand and competencies, and then moves to career awareness and navigation, defined educational pathways and supply channels, and the development of partnerships for each step.

A sustainable talent pipeline must be flexible to workforce demands, adaptable to changing skill needs, and nimble enough to reflect the pace of business change regardless of location, demographics, or policy. The key to building these sustainable pipelines is partnership, and the partnerships must include energy companies, educators, government entities, unions, service providers, and policy makers. Through CEWD, the industry has built State Energy Workforce Consortia across the country to identify the specific needs within their state and region, partner with educational providers from elementary to university levels, and develop diverse, qualified talent pools that meet the needs of utilities across the state.

In addition, CEWD has built an arsenal of tools, templates, and processes to enable member companies and state consortia to save time and money in the development and implementation of talent pipelines, learn from each other and the best practices in the industry, and benchmark results. Some of the resources available include:

- A Strategic Workforce Planning Process to define needs and balance supply and demand requirements.
- Get Into Energy: A common career awareness brand and campaign that covers five specific demographics—youth, low income young adults, military, women, and transitioning workers—and career pathways models that define the path from awareness to employment.
- Troops to Energy Jobs: A roadmap for military veterans and a national template for attracting, hiring, and retaining veterans in the energy industry.
- Competency models that define skills, knowledge, and abilities for each of the talent pipelines, curriculum, and the National Energy Education Network of partnered educational institutions.
- Web resources, convenings, communication channels, research and data, and communities of practice.

Companies, Educators, Associations, and CEWD All Have a Role

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.

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

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Center For ENERGY Workforce Development