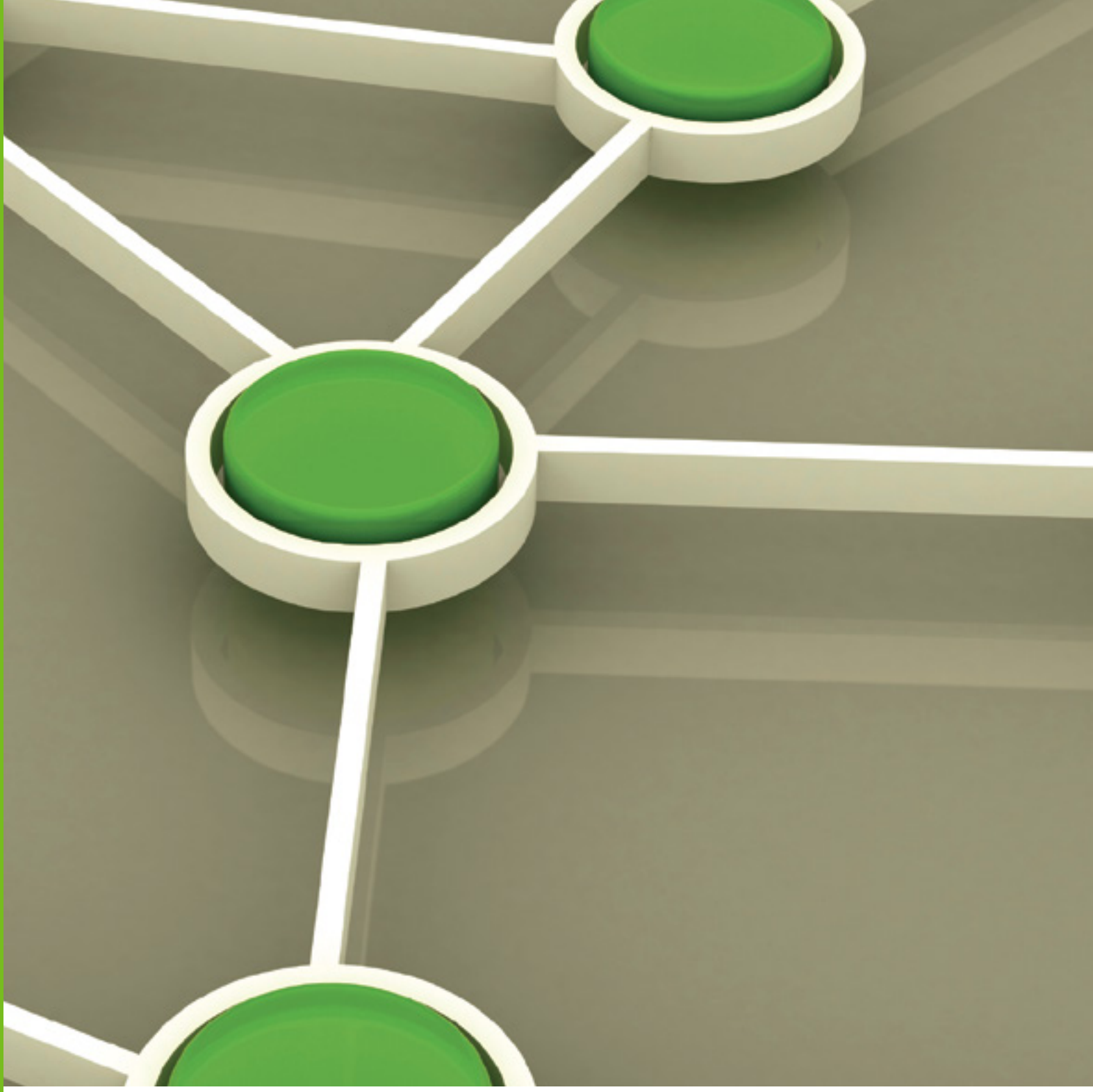


Competency-Based Credentials Case Studies

CSW
Corporation for a
Skilled Workforce

Good Jobs. Thriving Communities.

Acknowledgments

This report is part of a multi-year commitment by Corporation for a Skilled Workforce to advance the use of quality competency-based credentials in the United States. The research, convening, and writing for this report was made possible by a grant from the Surdna Foundation. We're grateful for their support of this work.

The CSW team that developed the report includes:

- Nancy Laprade, who served as the lead researcher and writer;
- Dr. Keith Bird, Senior Policy Fellow for Workforce and Postsecondary Education;
- Larry Good, Chair, Co-Founder & Senior Policy Fellow;
- Jeannine La Prad, President & CEO;
- Taryn MacFarlane, Vice President, Business & Community Innovation; and
- Chelsea Farley, consulting writer and editor.

We are indebted to a number of our partners who contributed substantial time in helping develop the case studies outlined in this report. In particular, we thank the following colleagues whose efforts greatly improved this product:

- Ann Randazzo, Executive Director, Center for Energy Workforce Development
- Jennifer McNelly, President, Manufacturing Institute (MI); Emily DeRocco, former President of the MI; Audrey Theis, consultant to MI; and Brent Weil, Senior Vice President for Education & Workforce of the MI
- Annette Parker, former Director of Automotive Manufacturing Technical Education Collaborative (AMTEC); Danine Alderete-Tomlin, AMTEC Executive Director; and Craig Hopkins, AMTEC Project Manager
- Jane M. Weissman, President/Chief Executive Officer, Interstate Renewable Energy Council
- Barbara Hins-Turner, Director, Pacific Northwest Center of Excellence for Clean Energy; Dr. Alan Hardcastle, Washington State University Energy Program; and Troy Nutter, Puget Sound Energy
- Martin Stöckmann, Head of Siemens Professional Education, Berlin; Nakisha Evans, formerly of Siemens Professional Education

Corporation for a Skilled Workforce is a national nonprofit organization that partners with government, business, and community leaders to develop good jobs and the skilled workers to fill them.

Introduction

Traditionally, employers, workers and students have used academic degrees and diplomas as a proxy for the skills and knowledge needed to perform on the job. There is growing interest in the use of *competency-based credentials* to complement this approach. High-quality, employer-backed, competency-based credentials can provide more precise information about job requirements and workers' proficiencies, offering benefits to:

- *Employers,* who can use credentials to inform hiring, deployment and promotion decisions and to ensure that relevant educational programs address their needs;
- *Students and workers,* who will have the ability to better navigate career pathways and transitions and who can offer competency-based credentials as proof of their skills and knowledge;
- *Educators,* who will be able to better align their curricula with industry requirements and can then cite employer-validated credentials as evidence that they prepare students for in-demand jobs; and
- *Public policymakers,* who can foster more agile, thriving labor markets by supporting the development and attainment of competency-based credentials.

Unfortunately, the current "market" for competency-based credentials is neither fully formed nor well functioning. In response, the Corporation for a Skilled Workforce (CSW) has embarked on a multi-year initiative to increase the quality and use of competency-based credentials. To lay a foundation for this work, we gathered information about a cross section of promising credentialing efforts. The case studies that appear in the following pages provide a glimpse of the variety of approaches being undertaken in different industries—by an array of different stakeholders— both in the U.S. and internationally. Interestingly, in spite of their diversity, these examples point to several common factors that appear to be critical to the success of competency-based credentials, including:

1. The involvement of employers at every stage of the credential's development;
2. A formal structured process, such as a Job/Task Analysis, to identify core knowledge areas, work functions, and skills; and
3. The creation of well-thought-out career pathways, as well as tiered/stackable credentials that allow students and workers to flexibly navigate these pathways.

Our companion paper, *Making a Market for Competency-Based Credentials*, explores these factors in more depth. It describes the current state of play in competency-based credentialing, outlines components of a quality credentialing process, and explores how the market for these credentials could be nurtured and brought to scale—by engaging businesses, workers and educational institutions more effectively.

The Case Studies

- **US Department of Labor Competency Model Clearinghouse**
- **Center for Energy Workforce Development (CEWD) Get Into Energy Career Pathways Model**
- **The Manufacturing Institute's Manufacturing Skills Certification System**
- **Automotive Manufacturing Technical Education Collaborative (AMTEC)**
- **Interstate Renewable Energy Council (IREC)**
- **Pacific Northwest Center of Excellence for Clean Energy (PNCECE)**
- **Siemens Mechatronic Systems Certification**

Our case studies represent a more in-depth look at these efforts. Since many of them are still developing, there is a great deal more information about each one that could be useful for understanding and advancing the field of competency-based credentials. For example, we do not report on the costs of developing the credentials or the economic rewards of using them. Dedicated research to establish the return-on-investment for different competency-based credentials is an important next step for the field—as is the creation of some kind of national infrastructure to promote *quality* credentialing processes, common definitions of key terms and coordination among existing efforts. See our report, *Making a Market for Competency-Based Credentials*, for more on these and other recommendations.

US Department of Labor Competency Model Clearinghouse

Competency models identify the knowledge, skills, and abilities necessary for success in a given occupation or industry, providing an essential foundation for a variety of credentials. The US Department of Labor (DOL) offers resources designed to help industry stakeholders develop such models and credentials, primarily through its Competency Model Clearinghouse.

The Clearinghouse provides access to validated competency models for 20 different industries, as well as tools that can be used to create competency models and career ladders for industries where they haven't yet been established. Two of the case studies included in this document, CEWD's *Get Into Energy* model and the NAM Skills Certification System, use the DOL competency model framework.

The DOL competency model is arranged into nine tiers, with each tier containing a set of related competencies. The tiers are displayed in a pyramidal shape, which represents increasing specificity and specialization of content—as a user moves up through the various tiers, the competencies become specific to certain industries and/or occupations.

The nine tiers are grouped into three categories.

- **Occupation-Related Competencies**
  - Tier 9 – Management competencies
  - Tier 8 – Occupation-specific requirements
  - Tier 7 – Occupation-specific technical competencies
  - Tier 6 – Occupation-specific knowledge competencies
- **Industry-Related Competencies**
  - Tier 5 – Industry-sector technical competencies
  - Tier 4 – Industry-wide technical competencies
- **Foundational Competencies**
  - Tier 3 – Workplace competencies
  - Tier 2 – Academic competencies
  - Tier 1 – Personal effectiveness competencies

For each industry, subject matter experts have worked together to develop foundational (tiers 1 - 3), industry-wide (tier 4), and in some cases, industry-sector (tier 5) competencies. The industry models are listed as either "approved" (meaning they have been verified by appropriate subject matter experts) or "draft" (currently under review by subject matter experts).

Basic Competency Models

Source: USDOL Competency Model Clearinghouse, http://www.careeronestop.org/CompetencyModel/.

Visitors to the Clearinghouse can use one of these available models and customize them as needed. If no pre-existing industry model exists, they can use a generic "building blocks" model designed to apply to all occupations, regardless of industry. Once a model is selected, the user customizes the model, tier by tier, with the options to:

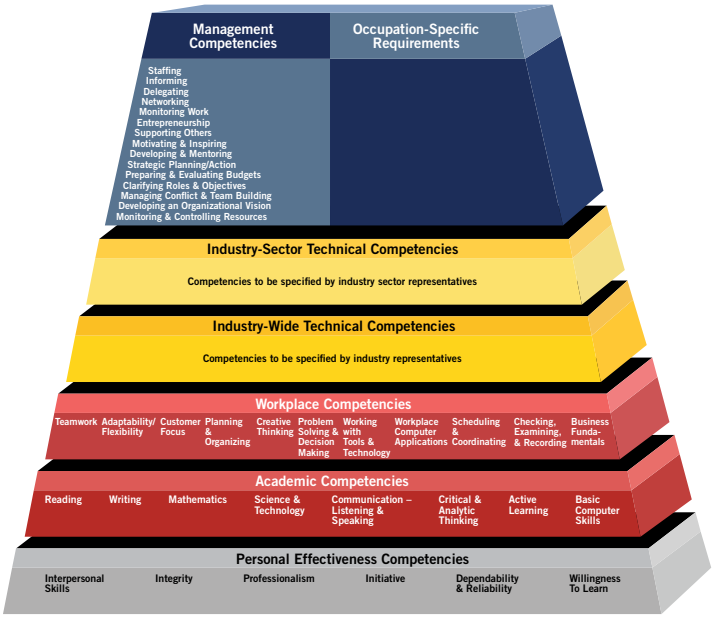
- Select key behaviors listed under each competency to include in the model,
- Include all competencies and key behaviors by checking the appropriate box,
- Add more key behaviors to existing competencies,
- Edit existing key behaviors on some competencies, and
- Add new competencies and associated key behaviors.

The end result is a model that captures the key competencies for a given industry or occupation.

US DOL recommends the following steps for using its framework to develop a competency model for a given industry:

1. *Analyze and synthesize existing national and state resources, skills standards, technical curriculum, and certifications in the industry sector.* This step is best accomplished using industry or subject matter experts who familiar with the terminology, processes, and skills required in the industry.

Building Blocks for Competency Models



Source: USDOL Competency Model Clearinghouse, http://www.careeronestop.org/CompetencyModel/competency-models/building-blocks-model.aspx.

The Clearinghouse contains competency models for the following industries:

- Advanced Manufacturing
- Aerospace
- Automation
- Bioscience
- Construction - Commercial
- Construction - Heavy
- Construction - Residential
- Energy
- Entrepreneurship
- Financial Services
- Geospatial Technology
- Health: Allied Health
- Health: Electronic Health Records
- Hospitality/Hotel and Lodging
- Information Technology
- Long-term Care, Supports, and Services
- Mechatronics
- Retail
- Transportation
- Water Sector

The process of gathering information involves:

- Defining the industry,
- Identifying the key occupations in the industry,
- Analyzing required knowledge, skills, and abilities to determine commonalities across the key occupations,
- Identifying and cataloging existing resources, and
- Aligning the knowledge, skills and abilities defined in the resources to the building blocks framework.

2. *Put this information into the DOL competency model framework.*
3. *Obtain feedback about the draft competency model from subject matter experts and target users.* Request input about:
   - The competency names, definitions, and (as relevant) the specific behaviors used to describe each competency. Discuss how this material should be edited to ensure that it accurately captures the essence of the competency in language that will "ring true" to users.
   - Whether any of the competencies in the draft model should be deleted because they are not relevant to, or important to, the target occupation(s), organization, or industry.
   - Whether any competencies should be added. If so, work with the group to derive definitions and behaviors describing those competencies.
4. *Refine the model based on this feedback.*
5. *Validate the competency model by distributing it widely to industry representatives and educational partners to encourage feedback and ultimate adoption.*
6. *Share the competency model with relevant stakeholders for daily use.*
7. *Use the model to align course content and credentials with industry requirements.* (For educational institutions).

Source: USDOL USDOL Competency Model Clearinghouse, http://www.careeronestop.org/CompetencyModel/.

The Center for Energy Workforce Development (CEWD) *Get Into Energy* Career Pathways Model

Organizing body: The Center for Energy Workforce Development (CEWD) is a nonprofit consortium of electric, natural gas and nuclear utilities and their associations, which was formed in 2006 to help address anticipated workforce shortages and build a skilled workforce pipeline that will meet future industry needs. See http://www.cewd.org/curriculum/ for more information.

Industry: Energy

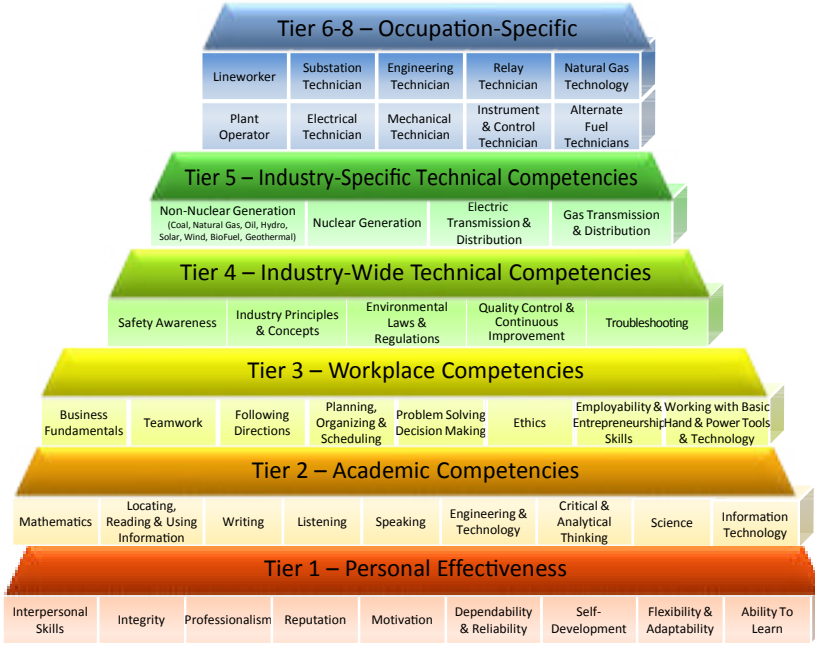
Geographic focus: National

Partners: CEWD's *Get Into Energy* Career Pathways model has been developed with input from a wide variety of organizations, including:

- American Association of Community Colleges
- American Council on Education
- American Gas Association
- American National Standards Institute
- Association of Career & Technical Education
- Council on Adult & Experiential Learning
- Edison Electric Institute
- National Rural Electric Cooperative Association
- Nuclear Energy Institute
- U.S. Department of Education
- U.S. Department of Labor

Approach: *The Get Into Energy* Career Pathways Model provides a roadmap for entry into skilled, utility technician positions in the energy industry, with pathways to higher-level jobs in a variety of work settings. CEWD and US DOL partnered to create the following Energy Industry Competency Model, which captures requirements for success at various levels in the industry.

Energy Industry Competency Model



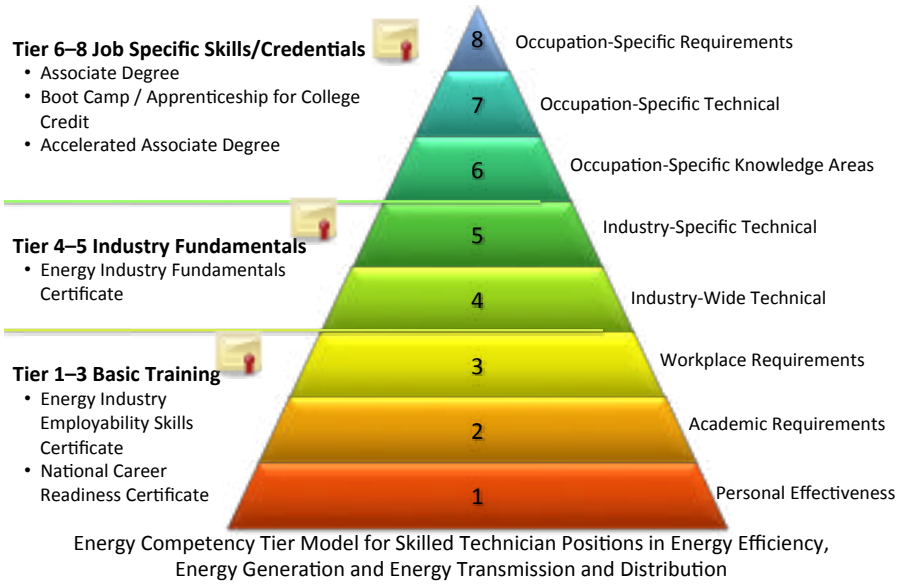
Source: Center for Energy Workforce Development, http://www.cewd.org/.

Based on these competencies, CEWD identified several stackable educational interventions:

1. *Basic training:* Corresponding to tiers 1 - 3 in the model, basic training focuses on improving work readiness and employability skills. The majority of these knowledge and skill sets are addressed in ACT's WorkKeys assessments, including the National Career Readiness Certificate (NCRC) Plus, Business Writing and Applied Technology.
2. *Energy industry fundamentals training:* Corresponding to tiers 4 and 5, this training leads to a credential CEWD has developed an Energy Industry Fundamentals certificate, which is accredited by the American National Standards Institute (ANSI). The program is offered by "Approved Course Providers" around the country (i.e., educational institutions that have been approved by CEWD by providing evidence that are adhering to the ANSI requirements), ensuring that a student who receives the certificate in one state will have achieved the same learning objectives as a student in another state.
3. *Job-specific training.* Corresponding to tiers 6 - 8, this training includes specific programs for lineworkers, pipefitters/pipelayers/welders, technicians, or plant operators.

The following figure displays credentials used for each tier.

Energy Competency Tiers and Stackable Credentials



Energy Competency Tier Model for Skilled Technician Positions in Energy Efficiency, Energy Generation and Energy Transmission and Distribution

Source: Center for Energy Workforce Development, http://www.cewd.org/.

Sources: CEWD and Get into Energy website: http://www.cewd.org/; http://getintoenergy.com/ ; Ann Randazzo, Executive Director of CEWD

The Manufacturing Institute's Manufacturing Skills Certification System

Organizing body: The Manufacturing Institute is the authority on the attraction, qualification, and development of world-class manufacturing talent in the United States. The Institute is a 501(c)3 affiliate of the National Association of Manufacturers (NAM), the largest manufacturing association in the United States, representing manufacturers of various sizes and industrial sectors from all 50 states. For more information, go to http://www.themanufacturinginstitute.org/.

Industry: Manufacturing

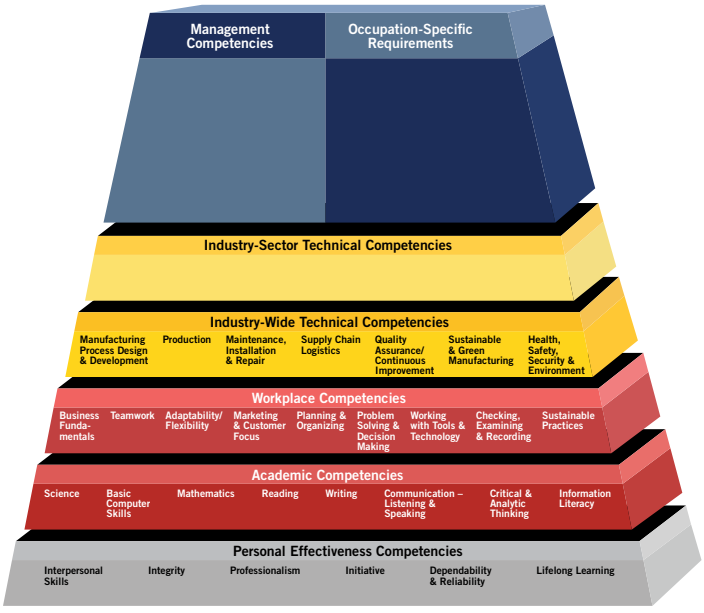
Geographic focus: National

Partners: Employers (i.e., NAM members) serve as the driving force behind the organization's credentialing efforts. They are champions for aligning training programs with industry needs and help promote the use of new credentials among their peers. Postsecondary educational institutions head up efforts to analyze existing curriculum against industry needs and certification requirements. More than 60 schools currently offer NAM-Endorsed Manufacturing Skills Certifications as a standard part of their manufacturing education programs.

Approach: In partnership with the USDOL and several other industry associations, the Institute developed the Advanced Manufacturing Competency Model, which defines the skills, knowledge, and abilities essential for successful performance in manufacturing occupations. The model consists of nine tiers, grouped into foundational employment competencies (tiers 1 - 3), entry-level manufacturing competencies (tiers 5 and 6), and competencies for specific manufacturing occupations (tiers 7 - 9).

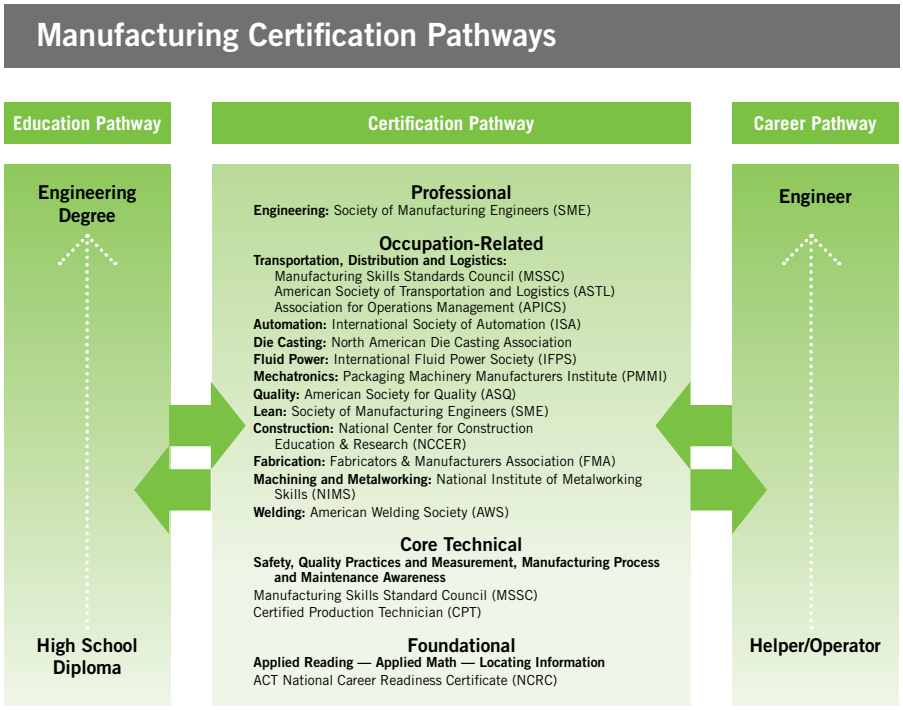
The Institute and its partners then set out to create a system of certificates and credentials that aligned with these competencies. They spent a year vetting 440 existing credentials, using criteria that included national portability, satisfaction of American National Standards Institute quality standards, third-party validation, and alignment with the Competency Model. Based on this work, the partners decided it would be better not to establish new certificates, but instead to endorse a select set of existing certificates that best aligned with the Advanced Manufacturing Competency Model—and then create a stackable credentials system using these certifications.

Advanced Manufacturing Competency Model



Source: USDOL Competency Model Clearinghouse, http://www.careeronestop.org/CompetencyModel/competency-models/advanced-manufacturing.aspx.

The figure below shows a sample of NAM-Endorsed Certifications (in the middle), with aligned educational pathways (on the left) and typical occupational/career pathways (on the right).



Source: The Manufacturing Institute, http://www.themanufacturinginstitute.org/Skills-Certification/Certifications/NAM-Endorsed-Certifications.aspx.

NAM's system uses ACT's National Career Readiness Certificate (NCRC) to verify the achievement of the core academic and workplace competencies shown in the first three tiers. These include applied math, locating information and reading for information for the NCRC; and expand to include the soft skills of work discipline, teamwork, customer service orientation, and managerial potential for the NCRC Plus.

A range of certifications are used for the competencies shown in tiers 5 and 6. Entry-level manufacturing jobs require competencies in health and safety, quality assurance and continual improvement, manufacturing processes, development and design, production and supply chain logistics. These are embedded in a variety of entry-level certifications, such as:

- The Manufacturing Skills Standards Council's Certified Production Technician (CPT) for entry-level production workers;
- The National Institute for Metal Working Skills' machining credentials for entry-level metal-working; and
- The American Welding Society's Certified Welder credentials for entry-level welders.

There are currently over 36 states using the Skills Certification System at varying levels, either through philanthropic supported initiatives or grassroots efforts. Their experience suggests the following step-by-step approach to establishing a certification program that aligns with the system:

1. *Research and planning – grounding efforts in real, local labor market demands.*
   - Use state and regional economic data to focus efforts.
   - Conduct an asset mapping of the programs, resources, and organizations that may support the establishment of skill certification pathways.
   - Determine advanced manufacturing career pathways in targeted areas.
   - Develop a timeline that reflects major milestones for action.
2. *Design and development – engaging employers and postsecondary stakeholders.*
   - Find the right faculty and college leadership.

- Objectively analyze existing curriculum against the needs of regional manufacturers and the requirements of targeted industry certifications.
- Work with employers who see the value of the certification model to build additional employer demand, while producing a supply of certified workers.

3. *Implementation – aligning existing curricula with certification requirements.*
   - Crosswalk existing curriculum to the NAM-endorsed industry certifications and develop new instructional modules to fill in curricular gaps.
   - Identify the critical applied math, science and technology (STEM) skills imbedded in certification requirements and build those skills into all career technical curricula.
   - Assess faculty capacity around the certification requirements in their content area and, if needed, implement professional development that may include training by certification sponsors.
   - Establish relationships with the credentialing organizations to ensure endorsement and recognition of the program.
   - Deploy an effective student recruitment strategy to generate interest in new certification pathways. Partner with other programs and organizations that work with people who may be interested in manufacturing careers.

4. *Measuring and sustaining progress - ensuring the continued success of the program.*
   - Identify key performance indicators to measure progress.
   - Identify policy barriers that are impeding progress and develop an agenda for driving needed policy change. Leverage local successes to promote regional/statewide change.
   - Develop a comprehensive plan to sustain the certification effort beyond grant funding.

Promoting the Use of Competency-Based Credentials

Interview with Jennifer McNelly, President, Manufacturing Institute, National Association of Manufacturers

What has been your approach to promoting and building out your credentialing system?
A few years back, we attempted to track and document the value proposition of industry credentials/ certifications, and we were unsuccessful because the data did not exist. Our current approach at the Manufacturing Institute is a "market push" to increase the supply of credentialed workers. Often employers respond to our question about whether they see the value in credentials with "I never knew the credentials existed." Instead of continuing to try to document demand and ROI, we decided to focus on building the supply of credentialed workers and educating employers on their value. For example, IT credentials have been one of the most successful credentialing efforts, with a high take-up rate by industry. The IT credential providers did a strong market push early on, and now there is significant demand for IT certificates. The ultimate demand by industry was a result of this strong market push of workers with IT credentials. So, we support setting a national goal around the number of certificates that should be attained, as Lumina has done. This provides a concrete goal for a market push approach. The Manufacturing Institute and its partners in the NAM-Endorsed Skills Certification System have set a goal to issue 500,000 certifications by the end of 2016.

What is needed to build out the Skills Certification System and better document return on investment (ROI)?

Over time, we need longitudinal data systems to track the value of credentials, but we don't have that system now. We currently have no mechanism to link private and public data systems, but we continue to move forward. A major goal for us is to have a common taxonomy—a common student identifier—that would link education records with wage records and employment outcomes. We can't measure the quality and value of credentials/ certificates without a common taxonomy and longitudinal data.

Documenting Value

The Manufacturing Institute has begun to document the value of credentials to employers, but much of the feedback remains anecdotal. For more information, see:

- Employer tool kit
- Benefits and results
- Employer case studies

Sources: Jennifer McNelly (interview), President of the Manufacturing Institute (MI); Emily DeRocco (interview), former President of the MI; Audrey Theis (interview), consultant to MI; Brent Weil, Senior Vice President for Education & Workforce of the MI; Manufacturing Institute website: http://www.themanufacturinginstitute.org/

The Automotive Manufacturing Technical Education Collaborative (AMTEC)

Organizing body: The Automotive Manufacturing Technical Education Collaborative (AMTEC) is a multistate collaboration of community and technical colleges and industry partners who seek to better prepare highly skilled workers for advanced manufacturing and technology industries. Visit http://autoworkforce.org/About_Us for more information.

Industry: Automobile and advanced manufacturing

Geographic focus: 13 states along the I-75 corridor (which runs north to south from Michigan to Florida).

Partners: What started as a partnership between Toyota and the Kentucky Community & Technical College System began to expand in 2005 into a multi-state model with international reach. AMTEC now involves 37 community colleges and 25 auto manufacturing plants in 13 states. This collaboration transcends the most prominent divisions in the industry, with representation from domestic and foreign auto manufacturers and union and non-union plants.

Approach: Deemed the "big collaboration" in a 2010 National Governor's Association Center for Best Practices' publication (A Sharper Focus on Technical Workers: How to Educate and Train for the Global Economy), AMTEC's main focus has been to develop a common curriculum for multi-skilled maintenance workers in the modern auto manufacturing production process. The curriculum was developed using the (turbo) Developing A CurricuIUM (DACUM) process, which provides a systematic, methodical, extremely detailed way to assess key competencies for different jobs. The Turbo DACUM steps as described in the NGA report include:

1. *Gathering the knowledge of actual workers—the subject matter experts.* The AMTEC curriculum development effort began by meeting with workers—not supervisors—and asking them a series of detailed questions about what tasks they undertake each day.
2. *Breaking the tasks down into as many small components as possible.* A general description of the task isn't sufficient. For example, one set of maintenance tasks identified during curriculum development was predicting and preventing problems, troubleshooting, and repairing and replacing brakes and clutches. But this was too general to design appropriate instructional material. So AMTEC broke this skill into its more detailed component parts, such as inspecting the brakes for wear and disassembling the disks and pads.
3. *Identifying the specific skills required to perform each task.* Once the tasks and their component parts were identified, AMTEC then worked with employees to determine skills needed to perform each task effectively. Naturally, there was a considerable overlap in the skills associated with different tasks. In the end, AMTEC had identified 26 different "duty areas" and more than 170 different tasks, all of which require a specific combination of skills.
4. *Identifying the significance of each duty area and each task in each plant.* Different plants operate in different ways, especially when dealing with numerous states and companies. So AMTEC asked company partners to rank the significance of each duty area and task in their particular plant. This information helped community colleges understand how skills are used locally (and whether AMTEC should emphasize or de-emphasize particular skill sets).
5. *Comparing the skill sets needed to the skill sets being taught.* An important part of the curriculum-development process was to bring in the actual instructors from community colleges to examine the list of skills required and identify which were currently being taught and which were not. This "gap analysis" helped both the company and the college determine where the curriculum gaps were and how to fill them.

AMTEC's approach embodies several important principles:

- **Focus on common and required tasks and skills:** The curriculum includes only those tasks and skills common to all industry partners, and focuses on tasks and skills that are required, not on how those tasks or skills are organized in any individual workplace.
- **Small learning modules:** Breaking technical tasks into small component parts makes it possible to teach those components in small "digestible" learning modules.
- **Contextual learning environment:** High-quality technical education should occur in a setting that is as close to the actual work environment as possible (not a traditional classroom).
- **Flexibility:** Students engaged in technical education will be more successful if they have greater flexibility in their learning options—including flexible scheduling, blended learning opportunities, accelerating learning, and "testing out" of skill areas where they are already competent.
- **Clear standards for assessments and credentialing:** Assessing and documenting worker competencies and providing tangible certification via credentials are important parts of the AMTEC model.

- **Industry engagement:** From the beginning, industry has been the driver of AMTEC's work. Business leaders came together to identify common occupations that were most important to their competiveness. Then industry subject matter experts engaged in an organized and precise process to determine essential tasks and skills for those jobs. Since most of AMTEC's college partners already had relationships with their region's auto industry leaders, the initiative has been able to build on and strengthen those existing relationships, rather than having to start from scratch. AMTEC's industry members participate in one or two face-to-face meetings per year, in addition to monthly online meetings, while the eight-person AMTEC Strategy Board (with representation from Toyota, Ford, Nissan, General Motors and AMTEC leadership) provides ongoing guidance about workforce development and industry needs.
- **Education pipeline collaboration:** More recently AMTEC has worked to strengthen its partnership efforts with University partners who are interested in collaboration, content, assessments and pathway development; and k-12 leadership.

Enhancing AMTEC's Impact

The National Science Foundation's (NSF) Project Impact Evaluation of AMTEC in 2011 examined how AMTEC might foster a stronger culture of innovation within the automotive industry. The findings pointed to the importance of:

- Stronger partnerships between community colleges and their industry partners with a focus on identifying industry standards, developing curriculum and assessment tools, and professional development opportunities.
- Enhanced information exchange between community colleges and industry partners for the purposes of the improvement and application of automotive manufacturing training for future employees.
- The development of a validated college curriculum aligned to industry-endorsed skills standards and the creation of research-based career pathway models to fit the needs of students, employees, and employers.
- The development of a nationally portable industry-endorsed certification process.

The NSF granted a renewal to AMTEC for 2013-2016 to continue successful collaborations, expansions, industry validation work, and career pathways research called AMTEC 2.

Sources: AMTEC website: http://autoworkforce.org/ ; Annette Parker (interview), former Director of AMTEC; Danine Alderete-Tomlin, AMTEC Executive Director; Craig Hopkins, AMTEC Project Manager; A Sharper Focus on Technical Workers: How to Educate and Train for the Global Economy, National Governor's Association Center for Best Practices, June 2010.

http://www.nga.org/files/live/sites/NGA/files/pdf/1007TECHNICALWORKERS.PDF

NSF Project Evaluation Report, 2011

The Interstate Renewable Energy Council's (IREC) Standards and Credentials

Organizing body: Founded in 1982, the Interstate Renewable Energy Council (IREC) is a non-profit organization dedicated to accelerating the use of renewable energy and energy efficiency. Its work includes "national efforts to build a quality-trained clean energy workforce." See http://www.irecusa.org/ for more information.

Industry: Clean energy technologies, including renewable energy, energy efficiency, distributed renewable energy generation, and other sustainability practices.

Geographic focus: North America

Partners: IREC works closely with numerous industry leaders and a diverse cross-section of clean energy industry stakeholders and subject matter experts. They are a standards developer accredited by the American National Standards Institute (ANSI) and operate an accreditation program in partnership with ANSI for clean energy certificate programs.

Approach: IREC has developed and uses three IREC Standards for its credentialing programs:

- **14732: General Requirements for the Accreditation of Clean Energy Certificate Programs**
  Forms the foundation for the accreditation of certificate-awarding entities that develop and administer credit or non-credit clean energy-related programs offered in formal educational institutions and other legal entities.
- **01023: General Requirements for the Accreditation of Clean Energy Technology Training**
  Identifies requirements for the quality systems, resources, personnel, and curriculum by which job-related training in clean energy technologies and practices may be accredited.
- **01024: General Requirements for the Certification of Clean Energy Technology Instructors and Master Trainers**
  Establishes requirements for the instructional and professional field experience, subject-matter expertise and instructional quality by which instructors and master trainers who conduct training in clean energy technologies and practices may become certified.

  It offers accreditation to programs and certification to trainers that meet its standards, which helps ensure that they effectively prepare students with the knowledge and skills required for a particular trade within the clean energy field.

  To ensure that training is effective and aligned with industry needs, IREC leverages third-party job task analyses (JTAs) that identify the skills and knowledge needed to perform various jobs safely and effectively. JTAs accepted by IREC also provide a critical foundation for related credentialing efforts, such as worker certification. IREC's Credentialing Program has accepted JTAs produced by third-party entities for the following job categories:
  - Retrofit Installer Technician
  - Energy Auditor
  - Crew Leader
  - Quality Control Inspector
  - PV Installation Professional
  - Solar Heating Installer
  - Small Wind Installer
  - PV Technical Sales
  - RISE Certified Solar Roofing Professional
  - Multifamily Energy Auditor
  - Multifamily Retrofit Project Manager
  - Multifamily Building Operator
  - Multifamily Quality Control Inspector

Additional JTAs are being developed by the U.S. Department of Energy and the National Institute of Building Sciences for the commercial building workforce.

These JTAs were developed by panels of 12-13 subject matter experts and validated by a diverse cross-section of industry stakeholders across the country. IREC evaluates and accepts JTAs conducted by others using the following guidelines:

- The JTA must clearly define the job. More specifically, the overall objective of the training must be clearly stated in terms of what the trained individual should be able to accomplish under given conditions.
- The JTA should identify all of the tasks and subtasks required for competent performance. Inclusion of "criticality" (i.e., the relative importance) and frequency of tasks and subtasks is highly recommended.
- The JTA should follow well accepted procedures for occupational analysis, such as the use of a DACUM (Developing a Curriculum), including review and validation by subject matter experts.
- There is documentation of Committee members, their credentials and the process that was followed to create the JTA. The process should include a balanced involvement of interested parties.

IREC's Job Task Analysis Guidance Document provides guidance for conformity with IREC's standards for accreditation; in particular, to assist applicants in developing and/or selecting a job task analysis (JTA) from which to form the basis of their curriculum or syllabus.

In 2013, IREC was a founding member of the Clean Energy Credentialing Coalition, a group of credentialing bodies that have joined together to demonstrate and promote the collective importance of third-party quality assessment, and the value it brings to building strong and competent renewable energy and energy efficiency markets. Recognized quality credentials send a strong signal that a rigorous standard has been met, offering a mark of distinction that strengthens the credential holder. Consumers can look for products that are certified for quality and safety, and credentialed professionals trained for appropriate, effective, safe installation and service.

In short, IREC develops consensus-based standards and related credentials to promote best practices and provide a benchmark for effective and safe workforce training practices in clean energy technology fields. In 2013, IREC was accredited by the American National Standards Institute (ANSI) which indicates that IREC's operating procedures meet the quality standards approved by ANSI. For more information on ANSI-IREC accreditation for certificate programs see, https://www.ansica.org/wwwversion2/outside/ANRECgeneral.asp?menuID=229

Sources: IREC website: http://www.irecusa.org/credentialing/; http://www.irecusa.org/standards-development/, Jane M. Weissman, President/Chief Executive Officer of IREC

Pacific Northwest Center of Excellence for Clean Energy

Organizing body: The *Pacific Northwest Center of Excellence for Clean Energy* (PNCECE) has its origins in 2004 as the *Center of Excellence for Energy Technology* at Centralia College. In 2004 the *Center of Excellence* served solely the Washington State energy industry. In July 2010, a three year $5M (leveraged to $12M) Department of Energy (DOE) grant was awarded to Centralia College, and the *Center of Excellence for Energy Technology* morphed into the regional *Pacific Northwest Center of Excellence for Clean Energy*. Today, PNCECE provides strategic coordination for the energy industry's skilled workforce in the Pacific Northwest. For more information, go to: http://cleanenergyexcellence.org/.

Industry: Energy

Geographic focus: Washington, Idaho, Montana, Oregon and Utah

Partners: PNCECE is a collaboration of utilities, the Bonneville Power Administration, the Pacific Northwest National Lab, organized labor, and multiple community colleges and universities across the five state region.

Approach: As a first step in 2004, PNCECE undertook significant labor market research to inform their strategy, identifying impending retirements, hiring challenges, and population shifts in the energy industry workforce. This research helped engage partners from industry, labor and education and promoted a shared vision for the work that would follow.

The PNCECE partnership has primarily focused on developing skills standards "that identify the knowledge, skills and abilities an individual needs to succeed in the workplace" for a variety of targeted occupations. The process used to create these standards (a modified version of the DACUM) involves the following steps:

1. Compiling and researching existing standards in related jobs and careers.
2. Conducting focus groups to identify critical work functions and key activities, define key activity performance indicators and identify technical knowledge, foundation skills, and personal qualities.
   - First step: A half-day with industry subject matter experts, typically managers, to identify and confirm the critical work functions of an occupation or job cluster.
   - Second step: A full two days spent with frontline workers who work in the jobs for which standards are being developed. They confirm or modify the critical work functions identified earlier, and define the many details that make up the key activities, performance indicators, technical knowledge, foundation skills, and personal qualities. This group also completes a Secretary's Commission on Achieving Necessary Skills (SCANS) related survey, designed to identify foundation and workplace skills.
3. Conduct a widely distributed survey of current workers to determine level of SCANS skills required for each job.
4. Develop work-related scenarios to place the skill standards in context of the work environment.
5. Verify the data gathered from focus groups. Send out a survey to industry representatives asking them to indicate the importance of each critical work function.
6. Disseminate skill standards information to involved parties from industry, education and labor for review and editing.

Engaging Industry Partners through a Strong Intermediary

From the beginning, PNCECE has been driven by the needs of the energy industry. In 2005, Barbara Hins-Turner, the current executive director, was recruited from industry to lead the effort. Her deep knowledge and experience in the industry have given her credibility with industry leaders. She describes one of her important roles as that of a "cultural broker" between the business and education communities.

Ms. Hins-Turner worked to strategically recruit key representatives from industry to play leadership roles during the start-up years of the Center, and she believes that having the right players at the table allowed them to "hit the ground running." One challenge it did present, however, was the importance of "getting a product out the door quickly, or losing the support of the industry leaders." That product—Power Plant Operator Skill Standards—was expeditiously produced and the Center was off to a strong start.

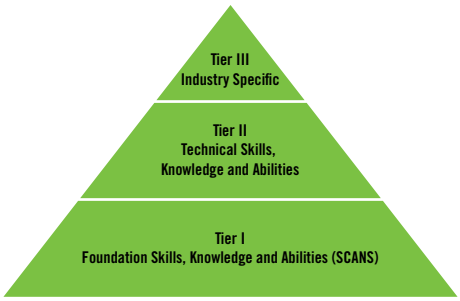
PNCECE's advisory board has been an important asset. The board meets twice a year officially, but Ms. Hins-Turner is in regular contact with members. Notably, succession planning was identified early on as a strategic priority. Once start-up industry leaders were ready to transition out of their leadership roles on the board, new leaders with credibility within the industry would have to take on leadership and champion roles. This proactive approach has helped maintain an engaged group of industry and organized labor partners.

PNCECE reports three key lessons that have emerged from their work to date:

1. Staff leadership and credibility make a significant difference.
2. Industry and organized labor partners must drive the partnership and goals. Industry leaders should be strategically identified and recruited.
3. Concrete, data-driven strategies, outcomes or products (skill standards in this case) are critical to keeping industry leaders engaged. Industry must be able to clearly see the value of their involvement.

The resulting skill standards are depicted in a "Pyramid of Competencies" with three broad categories:

- **Tier I** represents foundation skills, knowledge, abilities and personal qualities required of all workers.
- **Tier II** represents technical skills, knowledge and abilities common to a cluster of jobs across all industries or industry sectors. For workers in power generation, for example, knowledge of applicable federal, state, and local laws would be applicable across all sectors.
- **Tier III** represents industry-specific technical skills, knowledge and abilities that are unique to individual jobs or clusters and are the most prone to rapid change.



PNCECE developed the first skill standards—for power plant operators and mechanics—over a six-month period. This effort created momentum among workers, companies, and partners, which helped propel the development of additional standards. There are now 16 energy-related skill standards – see http://cleanenergyexcellence.org/skill-panel/. In general, it takes between 6 and 12 months to develop each of these standards—a process that deeply engages subject matter experts (SMEs) from industry and labor leaders. This work has created a foundation for participating colleges to build curricula that teach relevant skills and knowledge. PNCECE leadership reported that while there was some initial resistance from faculty about having the skill standards drive the curriculum, they are now buying into the process. Additionally, industry partners have used the skill standards to update their job descriptions and document the multi-skill approach to jobs, which has helped convince labor leaders that this approach is relevant and necessary for many of the occupations.

One example of a measurable outcome of this skill standards approach is found at the Power Plant Operator (PPO) position at Grand Coulee Dam. The apprenticeship program at Grand Coulee for these PPOs has been reduced by 18 months if the trainee has completed an Associate of Applied Science Energy Technology/Power Operations degree through a community college that bases their programs on the skill standards. Applicants are hired at the 4th step of the apprenticeship process and are hired at higher wages.

The Value of Skill Standards to Employers

Interview with Troy Nutter, Manager, Operational Training for Puget Sound Energy

From your employer perspective, what value do you see in the establishment and use of skill standards?

We have been at this work for about 8 years, and I see five major benefits of skill standards:

1. **Apprenticeship:** The competencies identified in setting the skill standards translate into the competencies we use here in industry for our apprenticeship training. These are validated, scientifically based competencies that provide a strong foundation in the stair step approach to apprenticeship learning.
2. **Direct link/alignment between college courses and work-based apprenticeship:** The skill standards directly tie the apprenticeship-related courses at the college to the same set of standards we are using here in our apprenticeship training.
3. **Common language:** The skill standards help to focus the educational folks and labor unions on the competencies that are needed in industry. We are able to talk the same language through the skill standards.
4. **Contextualization:** The skill standards inform government and K-12 education about how important it is to contextualize the identified foundational skills into the K-12 curriculum continuum approach.
5. **Military skill crosswalks:** The skill standards are valuable for constructing crosswalks from military occupational standards to the private sector. This can be used by private sector as well as educational and governmental agencies to validate the attainment of competencies.

How do credentials and credentialing process fit into your skills standards effort?

We support credentialing as a portable tool that makes the applicant more valuable by creating perceived value to both employers and employees. This value stems from the credential being based on an industry validated skill standard. The skill standards also allow for monetization of skill levels on a consistent and objective basis. Sometimes employers worry that another company will steal their qualified, credentialed workers—but I believe we (industry partners) are all in this together – that we all want quality workers. We create synergies by working together—the regional approach is absolutely valuable. We can't afford to do this work on our own. The conversation among partners is as valuable as the products (primarily skill standards in our case) that come out of our partnership. We share common concerns and develop solutions through a strategic approach.

Sources: Barbara Hins-Turner (interview), Director of PNCECE; Dr. Alan Hardcastle, Washington State University Energy Program; and Troy Nutter (interview), Puget Sound Energy.

Siemens Mechatronic Systems Certification

Organizing body: Siemens Technical Academy (STA) in Berlin, Germany – is part of Siemens, a multi-national corporation involved in energy, healthcare, industrial products and solutions, and infrastructure and cities. The Siemens Technik Akademie (STA) Berlin is an international technical college within the Siemens Professional Education system. For more information, go to: http://www.technical-academy.com.

Industry: Advanced Manufacturing (Engineering/ Mechatronics)

Geographic focus: International

Partners: Siemens has built an international skills certification program, in partnership with schools in several countries worldwide.

Approach: The STA program leads to three primary credentials: 1) Siemens Mechatronic Systems Certification (SMSCP); 2) a state-approved qualification Associate Engineer for Mechatronic Systems after two years; and 3) the Bachelor of Engineering in Electronic Systems after four years of study. The Associate Engineer and the Bachelor programs are the basic business of the STA, while the SMSCP is provided as an external international program.

The Siemens Mechatronic Systems Certification Program (SMSCP) represents a promising example of an industry developed, competency-based credential that is internationally portable. Created to provide "a holistic mechatronic systems certification that could be easily adapted into a variety of educational programs," the SMSCP incorporates:

1. A systems approach teaching philosophy that focuses on the early introduction of complete operational systems and uses those systems to teach both practical and theoretical concepts, specifically integrating hands-on learning and practical technical trouble-shooting/ problem solving into classroom instruction. This emphasis on systems thinking and troubleshooting that encourages students to see the 'big picture' of overall integrated systems' functioning and the interrelationship between different technical subsystems.
2. A focus on professional development of instructors as a train the trainer approach, so they are in a better position to help students gain the technical and thinking skills needed by industry.
3. Defining standard mechatronics-related subject areas, so that students gain the necessary technical skills in automation, electrical, mechanical, and process management.
4. Having an objective industry-aligned certification exam that tests and validates students' competencies as they relate to mechatronics and system troubleshooting.
5. Always keeping certain foundational skills in focus – Internationality, Networking, Knowledge Transfer and Teamwork.

Genesis of the SMSCP

According to STA officials, the decision to focus on Mechatronics (for the Siemens Mechatronic Systems Certification Program (SMSCP)) came from the desire to align the certification program with the German education standards already being used in the STA Associate Engineer program. And mechatronic skill sets were in demand internally, as several Siemens' business units wanted to have a highly skilled technician/technical supervisor that sat between regular production/ maintenance workers and the traditional engineering staff. The general competencies for the STA Mechatronics program were identified and outlined through alignment with the German BIBB requirements for the state occupation of Industrial Technologists, as well as the competencies tested by the IHK (Chamber of Commerce) on its required state certification exam.

STA developed three core job profiles, which outlined the needed skill sets for a mechanical systems operator, mechatronic systems technician, and a mechatronics engineer. This was done in consultation with Siemens business units; Siemens customers; an international group of workforce development professionals from the US, Germany, and Asia; and the German BIBB (Federal Institute for Vocational Education and Training). The group worked to identify common technical competency areas and skill requirements that would be applicable across international borders, and intentionally left enough "wiggle room" so the training could be customized to meet local labor market needs. This work provided the basis for outlining competencies that all partner schools would have to incorporate into their technical education programs to successfully prepare their students for SMSCP certification exams. Finally, Siemens developed Instructor Certification courses to ensure instructors were prepared to implement systems approach teaching.

As would be expected, Siemens units rely on the SMSCP for internal hiring. But it also applies across a wide variety of industries that have a need for mechatronics. Siemens reports that "many partner schools find that it aligns quite well to their local industrial and advanced manufacturing employers' hiring requirements" and helps them meet local industry needs.

Sources: Martin Stöckmann, Head of Siemens Professional Education, Berlin; Nakisha Evans, formerly of Siemens Professional Education; website: http://www.technical-academy.com

CSW
Corporation for a
Skilled Workforce

Good Jobs. Thriving Communities.

1100 Victors Way, Suite 10
Ann Arbor, MI 48108

(734) 769-2900 (office)
(734) 769-2950 (fax)

www.skilledwork.org