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Workforce Analysis Report: Energy Sector Jobs in Greater Pittsburgh

EXECUTIVE SUMMARY REPORT

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I. Executive Summary

Report Background and Objectives

The Pittsburgh region is home to almost 1,000 companies, 41,000 direct energy jobs, and a $19 billion economic impact, or 16% of the 10-county region's economy. Coordination across all energy sectors, seen below, is the best way to expand growth throughout the entire industry. Having a compatible workforce in place to meet demand, with appropriate skills and training, will be critical to the region's success.

TRADITIONAL SECTORS	COAL	- PA ranks fourth in the U.S. in coal production - High concentration of mining equipment manufacturers and other firms supporting the coal industry - Opportunities to leverage the only fossil fuel national research lab (NETL), only private sector coal R&D firm in the U.S. (CONSOL) and university research (CMU, Pitt, Penn State, WVU)
	GAS	- Marcellus Shale is one of the largest new plays in the U.S.; PA ranked 2nd in number of producing gas wells in the U.S.; emergence of Utica Shale increases oil and gas opportunity - Concentration of advanced materials manufacturing, heavy equipment, and chemical firms - Breakthroughs in unconventional drilling combined with continuing improvements to fracking and water treatment
	NUCLEAR	- Half of the world's existing reactors based on locally developed technology, resulting in proximate demand for supplies and services - On-going innovation in commercial nuclear power and Naval propulsion research creates regional hub for R&D, complemented with very high concentration of nuclear engineers and technicians
ALTERNATIVE SECTORS	SOLAR	- Concentration in glass, materials and electrical components position region as preferred supplier - Developing cost-competitive solar technology by improving glass and solar components
	WIND	- Concentration of advanced materials manufacturing, coatings, chemicals, and fiberglass firms - On-going materials research to make wind installations more efficient and cost-effective
CONSERVATION & DISTRIBUTION SYSTEMS	TRANSMISSION & DISTRIBUTION COMPONENTS	- Concentration of electronic systems and components for traditional and alternative energy applications - Systems integration breakthroughs are the focus of regional research consortium
	INTELLIGENT BUILDING TECHNOLOGIES	- Concentration of electronic systems and components for building technology applications - Academic programs for advancing building technologies

Industry, educators, the public workforce system, and policy-makers need a clear picture of the region's most pressing energy-related workforce needs, especially the anticipated supply and demand of energy-related jobs. With an understanding of common occupations across all energy sectors, talented individuals will begin to understand the "thickness" of job opportunity, the ability to put their hard-won skills to use across a variety of industries and sectors. More potential job-seekers can be encouraged to pursue the education and/or training needed to qualify, therefore helping better balance supply with demand.

For educators and training providers, a comprehensive understanding of demand will alleviate the need to attempt to offer all things to all students. Instead they will be able to better share industry-sanctioned curriculum, while potentially forming networks of training providers to support individual centers of excellence or areas of specialty, making training both more effective and efficient for training providers. Such an approach could build upon the successful model of ShaleNET, a collaborative which provides training in targeted occupations across the entire Marcellus Shale footprint.

Executive Summary Report

The Allegheny Conference on Community Development (the Conference), in partnership with the Energy Alliance of Greater Pittsburgh (Energy Alliance), engaged Development Dimensions International (DDI) to conduct an occupational analysis, the results of which are documented in the full report. The Energy Alliance, of which the Conference is a co-convener with Innovation Works, is an initiative of nearly 100 companies, universities, governmental agencies, and non-profits dedicated to making the Greater Pittsburgh region the center of American energy in the 21st century. The occupational analysis was designed to identify "Targeted Jobs" in the 10-county region of Southwestern Pennsylvania and identify the critical knowledge, skills, and abilities required for success in those jobs. DDI is a worldwide expert in talent management and occupational analysis. The Pittsburgh-based company has conducted thousands of occupational analyses over the last 40 years for some of the largest organizations in the world, and has amassed a rich database of the knowledge, skills, and experience required for hundreds of jobs across all industries.

For the purposes of this study, Targeted Jobs were defined as those jobs meeting the following two criteria:

1. Employers in the region anticipate high-volume hiring from the present through 2020.
2. Employers have experienced and expect to continue experiencing difficulty finding applicants with the required skills from within the current available workforce.

While the focus of this analysis has been the 10 counties of southwestern Pennsylvania, the footprint of the Energy Alliance is greater, mirroring that of the Power of 32. The Power of 32 bridges the borders of 32 counties and four states to create a shared vision that covers 17,380 square miles. This larger footprint is home to 1,700 energy establishments responsible for 60,000+ direct energy jobs and a $25 billion economic impact—direct and indirect—or 15% of the greater region's economy. The findings of this occupational analysis will be correlated to demand across the additional 22 counties to develop a broader, proactive collaborative focused on increasing the availability of high-demand energy talent.

Target Jobs Identified

An online survey was completed by a cross section of 37 organizations representing all seven energy sectors: Coal, Gas, Nuclear, Solar, Wind, Transmission and Distribution, and Intelligent Building Technologies. Analysis of survey data was conducted to identify Target Jobs for which forecasted hiring volume through 2020 is high and for which employers expressed low confidence in their ability to find candidates with the required knowledge, skills, and experience. The analysis yielded 14 Target Jobs. Interviews and focus groups were conducted with subject matter experts across these organizations to identify the knowledge, skills, and experience needed for each of the Target Jobs.

TARGET JOBS	SAMPLE JOB TITLES
Helpers—Installation, Maintenance, and Repair Workers	Maintenance Technician, Maintenance Mechanic, Building Equipment Operator (BEO), Maintenance Helper, Trades Helper, Well Tender, Facilities Maintenance Technician, Mechanic Helper
Mechanical Engineers	Mechanical Engineer, Design Engineer, Product Engineer, Mechanical Design Engineer, Process Engineer, Equipment Engineer, Design Maintenance Engineer, Systems Engineer
Inspectors, Testers, Sorters, Samplers, and Weighers	Inspector, Quality Inspector, Quality Technician, Quality Assurance Inspector, Quality Control Inspector, Quality Auditor, Picker/Packer, Quality Assurance Auditor, Quality Control Technician
First-Line Supervisors of Construction Trades and Extraction Workers	Construction Supervisor, Construction Foreman, Construction Superintendent, Project Manager, Field Supervisor, Project Superintendent, Job Foreman, Field Operations Supervisor, General Foreman
Electrical Engineers	Electrical Engineer, Electrical Design Engineer, Project Engineer, Electrical Controls Engineer, Test Engineer, Hardware Design Engineer, Circuits Engineer, Electrical Project Engineer
First-Line Supervisors of Production and Operating Workers	Production Supervisor, Manufacturing Supervisor, Team Leader, Shift Supervisor, Production Manager, Supervisor, Assembly Supervisor
Welders, Cutters, Solderers, and Braziers	Welder, Welder-Fitter, Fabricator, Maintenance Welder, MIG Welder, Sub Arc Operator, Brazier, Solderer, Electrical Assembler
Industrial Machinery Mechanics	Maintenance Mechanic, Maintenance Technician, Mechanic, Engineering Technician, Master Mechanic, Industrial Machinery Mechanic, Machine Adjuster, Overhauler, Industrial Electrician, Industrial Mechanic
Sales Managers	Sales Manager, Sales Supervisor, Sales Representative
Heavy and Tractor-Trailer Truck Drivers	Truck Driver, Driver, Over the Road Driver (OTR Driver), Delivery Driver, Road Driver, Semi Truck Driver
Petroleum Engineers	Reservoir Engineer, Petroleum Engineer, Drilling Engineer, Petroleum Production Engineer, Operations Engineer, Completions Engineer
Property and Real Estate Managers (Landman)	Landman, Property Manager, Lease Administration Supervisor, Leasing Manager
Computer-Controlled Machine Tool Operators, Metal and Plastic	Computer Numerical Control (CNC) Operator, CNC Machinist, CNC Lathe Operator, CNC Machine Operator, CNC Mill Operator, CNC Set Up Technician, CNC Set-Up Operator
Machinists	Machinist, Tool Room Machinist, Machine Operator, Machine Repair Person, Machinist Tool and Die, Automation Technician, Gear Machinist, Maintenance Specialist, Set-Up Machinist

Key Findings

While the sample size (37 organizations across all seven energy sectors) is not sufficient to make detailed statistical inferences about levels of demand by specific job and sector, the study's descriptive statistics are of substantial practical significance. As detailed in the full report, the study has clearly and unequivocally identified *14 critical, difficult-to-fill jobs for which nearly 2,000 hires are forecasted between now and 2020*. And that is just for these 37 organizations. The actual number of hires into these jobs across almost 1,000 energy companies in the 10-county region will be much higher. In addition, demand for these occupations is strong in other economic sectors beyond energy, intensifying potential talent shortages. Because we know these jobs are difficult to fill due to shortages of skills in the current workforce, the critical importance of closing the skills gap is clear.

***Target Jobs** defined as High Volume Hiring Forecasted + Shortage of Required Skills*

Details from the online jobs survey and complete job profiles for each of the 14 Target Jobs are available in the full report. The following important outcomes and trends underscore the need for proactive, coordinated regional workforce development.

High Volume Hiring – For the period of 2012-2020, over 7,000 hires were forecasted from these 37 organizations alone, with almost 2,000 of those coming from the difficult-to-fill Target Jobs. Approximately 40% of this forecasted hiring volume is attributable to growth in the industry, with the remaining hires linked to attrition/retirements in the current workforce. When we extrapolate those numbers from 37 organizations to the region's additional 900+ existing energy-related organizations, the magnitude of the potential talent shortfall is considerable and reinforces a collective call to action.

Employers Concerned about Workforce Readiness – Organizations expressed serious concerns regarding their ability to fill these Target Jobs with the current available workforce. Survey respondents indicated being highly confident in their ability to fill only 1 of every 5 forecasted Target Job openings. The most common reason for their lack of confidence was the deficiency in technical and/or professional skills required to perform these jobs.

Target Jobs in Multiple Sectors – Each of the 14 difficult-to-fill Target Jobs appear in two or more energy sectors (coal, gas, nuclear, solar, wind, transmission and distribution, and intelligent building technologies).

High demand, difficult-to-fill jobs across multiple energy sectors.

Nine of the 14 Target Jobs appear across three or more sectors. Mechanical Engineers are required across all six sectors.[1] Efforts to build the needed workforce skills for any one of these jobs will have a positive effect across the region's broader energy footprint.

TARGET JOBS	Coal	Gas	Nuclear	Solar	Transmission and Distribution	Wind
Mechanical Engineers	●	●	●	●	●	●
Electrical Engineers	●	●	●		●	●
First-Line Supervisors of Production and Operating Workers	●	●			●	●
Welders, Cutters, Solderers, and Braziers		●	●	●	●	
Computer-Controlled Machine Tool Operators, Metal and Plastic		●			●	●
Helpers—Installation, Maintenance, and Repair Workers		●			●	●
Industrial Machinery Mechanics	●	●			●	
Machinists	●		●	●		
Sales Managers	●	●			●	
First-Line Supervisors of Construction Trades and Extraction Workers	●	●				
Heavy and Tractor-Trailer Truck Drivers		●			●	
Inspectors, Testers, Sorters, Samplers, and Weighers			●	●		
Property, Real Estate Managers (Landman)	●	●				
Petroleum Engineers		●				

As part of the scope of this project, DDI conducted a review of relevant literature. The specific recommendations for action included in this report are based on consideration of the analysis findings and both broad and specific recommendations made in a number of significant national studies.[2]

[1] Survey response from the Intelligent Building and Design sector was not sufficient for inclusion in the cross-sector comparisons.

[2] For example, see *Pathways to Prosperity,* Harvard Graduate School of Education, February 2011; *Across the Great Divide: Perspectives of CEOs and College Presidents on America's Higher Education and Skills Gap,* Civic Enterprises, Corporate Voices for Working Families in Association with Institute for a Competitive Workforce, U.S. Chamber of Commerce, Peter D. Hart Research Associates, 2011; *The Ill-Prepared U.S. Workforce,* The Conference Board et al, 2009; *STEM: Good Jobs Now and for the Future,* U.S. Department of Commerce 2011; *Building a Science, Technology, Engineering and Math Education Agenda,* National Governors Association, 2011.

Target Jobs: Wages and Required Knowledge, Skills, and Experience

Postsecondary Education – Thirteen of the 14 Target Jobs require certification and/or degrees beyond high school/GED. Additional details regarding reported education requirements can be found in the full report.

TARGET JOBS	Annual Wages[3]		Education and Experience Required
	Entry Wage ($)	Experienced Wage ($)	
Inspectors, Testers, Sorters, Samplers, and Weighers	25,010	46,580	High School or GED
Heavy and Tractor-Trailer Truck Drivers	30,800	49,640	High School or GED plus Trade School and Certifications
Industrial Machinery Mechanics	35,030	53,810	
Helpers—Installation, Maintenance, and Repair Workers	17,590	32,890	
Welders, Cutters, Solderers, and Braziers	26,620	41,740	
Computer-Controlled Machine Tool Operators, Metal and Plastic	28,430	41,060	Most positions require Associate Degree
Machinists	28,500	45,390	
Property, Real Estate, and Community Association Managers (Landman)	46,640	88,860	
First-Line Supervisors of Construction Trades and Extraction Workers	49,980	77,850	
First-Line Supervisors of Production and Operating Workers	38,390	67,540	
Mechanical Engineers	60,010	95,570	Bachelor's Degree
Electrical Engineers	60,030	100,790	
Sales Managers	61,040	141,580	
Petroleum Engineers	60,150	165,640	

[3] From the Pennsylvania Department of Labor and Industry's Center for Workforce Information and Analytics. Data is from the Three Rivers Workforce Investment Area.

Key Workforce Competencies – In addition to the technical educational requirements identified in this study, there were a range of critical behavioral competencies important for success in each of the 14 Target Jobs. A comprehensive mapping of Target Jobs to behavioral competencies and complete definitions of those competencies is documented in the full report. Some of the developable competencies that appeared most frequently across these jobs included:

- Decision Making
- Safety Awareness
- Communication
- Planning and Organizing
- Contributing to Team Success

These and other workforce competencies should be addressed in specialized curricula and learning tracks for each of the Target Jobs.

Recommendations for Action

1. Industry, the public workforce system, and educational institutions need to collaborate, developing common messaging to effectively *promote the long-term stability and earning potential of these energy-related careers.* A focused effort within energy sectors could have sustained impact.
2. Competition for talent is already tight in many of the occupations identified in this study. Tight supply of talent means energy companies will be competing with other economic sectors. Collaboration among energy companies to market these jobs aggressively, especially to younger talent, as *high-paying, important, and rewarding careers* must become a top priority. Companies in every energy sector need to work together closely to eradicate outdated perceptions of energy jobs, especially those considered middle-skill level. Given the growing global focus on the importance of energy, these jobs can and should be promoted as key contributors to our nation's goal of energy security.
3. In advising both youth and adults on career opportunities, *more emphasis should be placed on occupational competencies and skills*, rather than discussions focused solely on a single industry or sector. As this analysis demonstrates, common skill sets are in high demand across numerous sectors. Such a focus will help talent better understand the depth of job opportunity and can also help create a more agile workforce.
4. *Clear educational pathways between secondary and postsecondary education and training need to be articulated* and far more widely promoted. The traditional dichotomy of college track vs. non-college is no longer a useful construct; the reality is that a 21st-century energy workforce will not only require post-secondary education, but will need to remain in a continuous learning mode.
5. It will be critical to extend awareness of the depth and significance of energy-related economic opportunity—and what will be required from students—to teachers and school administrators focused on grades K-8, not just those serving high school. *Middle and high school students all require a strong grounding in a rigorous STEM (Science, Technology, Engineering, and Math) curriculum.* Increasing technological advances in all aspects of the workplace will demand the kind of literacy developed through STEM coursework. At the same time, it is important to build real-world relevancy into STEM curriculum; such focus can serve a dual purpose of engagement and career awareness.

6. *Industry must take the lead* in proactively creating and supporting partnerships with and among regional secondary, technical, and community colleges, helping to ensure effective curricula and learning tracks for each of the Target Jobs. New approaches need to be explored that would cover both the technical and behavioral skills identified in this study. Classroom instruction on "soft skills" (e.g., Decision Making, Communication, Teamwork), not just technical ones, should be accompanied by a workplace experience for students so that they can apply the required competencies in a real-world setting.
7. Job shadowing, internships, and problem-based learning outside the classroom have all been proven to be effective in creating *greater career awareness in high school students*. This in turn can help students make better informed post-secondary educational choices. A collaborative approach to sponsoring such programs among energy companies could have a significant influence in the region. Company investment in such endeavors is also a strong public statement that the skills being taught are highly valued by employers.
8. Industry must be much more proactive with educators, guidance counselors, and school administrators to *give greater clarity* to what educational and curricular elements will be required by jobs in a rapidly advancing energy industry. At the same time, students will be best served if they are clearly informed about multiple educational and training alternatives, including promotion of 2+2+2, apprenticeship, and other pathways from high school to career.