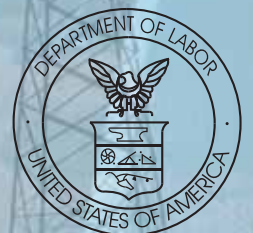


# Identifying and Addressing Workforce Challenges in America's Energy Industry

ENERGY



# **Identifying and Addressing Workforce Challenges in America's Energy Industry**

## **High Growth Job Training Initiative**

The U.S. Department of Labor  
Employment and Training Administration

**This report was prepared by the U.S. Department of Labor, Employment and Training Administration in partnership with DTI Associates, A Haverstick Company.**

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# Preface

The following report, prepared by the U.S. Department of Labor (DOL), Employment and Training Administration (ETA), details the efforts around former President George W. Bush's High Growth Job Training Initiative for the energy industry. It provides an overview of the industry, outlines the goals and activities of the High Growth Job Training Initiative, examines the workforce challenges facing the industry, and discusses possible solutions to address the industry's challenges.

ETA recognizes and commends the ongoing commitment of the energy industry to workforce development and will work collaboratively with the industry to support and replicate its successes. As this report details, the energy industry faces pressing workforce challenges ranging from the aging of the workforce to the need for new training strategies for entry-level and incumbent workers. Comprehensive partnerships among education, employment, and workforce and economic development organizations are needed to effectively address these challenges, and ETA seeks to partner with industry to model such collaborations.

This report presents the findings from an information gathering process that involved a variety of energy industry stakeholders reflecting on workforce issues and catalogs their proposed solutions. The report outlines the process where ETA, energy industry employers, education, and the public workforce system formed partnerships and developed proposed solutions to address key workforce challenges.

DOL and ETA would like to thank the energy industry stakeholders for their leadership, commitment and participation in this process. The thoughtful insights and genuine concerns expressed by companies, educators, and all stakeholders give their recommendations the credibility and potency required to drive forward the changes needed. To those reading about this initiative for the first time, ETA welcomes your contributions to address the challenges that face America's energy industry.

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# Executive Summary

The High Growth Job Training Initiative is designed to provide national leadership for a demand-driven workforce system that ensures no worker is left behind. It is a strategic effort to prepare workers for new and increasing job opportunities in high-growth/high demand and economically vital industries and sectors of the American economy. Through the initiative the Employment and Training Administration (ETA) identifies high-growth/high demand industries such as energy, works with industry leaders to determine their key workforce challenges, and invests in demonstration projects that ensure individuals gain the skills that they need to get good jobs with good wages in rapidly expanding or transforming industries. The foundation of this initiative is partnerships between the publicly funded workforce investment system, business and industry representatives, and education and training providers, such as community colleges. The purpose of these partnerships is to develop innovative solutions or replicate models that address a targeted industry's workforce issues.

The energy industry was selected as one of 14 targeted industries in the High Growth Job Training Initiative. Industries were selected according to one or more of the following characteristics:

- A substantial number of new jobs will be added in the industry.
- The industry has a significant impact on the overall economy.
- The industry has an impact on the growth of other industries.
- Evolving technology used in the targeted industry requires workers to have new skill sets.
- The industry includes emerging businesses that are projected to grow.

ETA included the energy industry in the High Growth Job Training Initiative because of the vital role it plays in the U.S. economy, and due to rapidly evolving technology that requires workers to gain an increasingly technical skill set.

## Identifying Energy Industry Workforce Challenges

ETA conducted six executive forums for energy industry executives in 2004 and one forum in 2005. Energy industry sectors engaged include all segments of the oil and gas industry, electric and natural gas utilities, nuclear energy, and mining. At each forum, Assistant Secretary Emily Stover DeRocco explained ETA's three primary goals for the forums: 1) to identify employers' challenges, 2) to share how employers can access public workforce services, and 3) to obtain feedback from employers on what their needs are and how the public workforce system can better serve industry.

The information collected over the course of the High Growth Initiative in energy provides insight into what industry executives identify as their key workforce development concerns. *It is clear that there is demand for new workers, recruited from new sources, trained with new skill sets, along with training for incumbent workers to upgrade their skills.*

Executives at these forums identified a broad array of workforce challenges shared across the industry. The challenges centered around four primary themes:

- The negative public image that is challenging the industry's recruitment efforts
- The need for skill development of both new and incumbent workers
- The aging of the workforce in the industry and imminent retirement of a large segment of incumbent workers
- The need for both conventional and new approaches to education and training

## Developing Workforce Solutions

These challenges became the focus of mixed stakeholder workgroups at a Workforce Solutions Forum convened in Houston, Texas on December 14-15, 2004. ETA invited industry employers, education and training providers, representatives of the public workforce system, and other key stakeholders to identify innovative solutions to address the industry's workforce challenges. Solutions Forum participants worked in small groups to brainstorm and prioritize innovative workforce solutions, propose foundational models, and document the critical attributes, key stakeholders, resources, implementation barriers and other pertinent information in a "solutions matrix," or roadmap, to help inform ETA's investments in strategies for workforce development in the energy industry.

Ninety-one energy industry stakeholders developed twenty-five solutions matrices during the Energy Industry Workforce Solutions Forum. (See appendix I.) Below is an overview of the four major workforce challenges facing the energy industry and their proposed solutions for each.

### **Challenge #1: Image, Outreach, and Recruitment**

- Proposed Solution 1: National Marketing Campaign to Improve the Industry's Image
- Proposed Solution 2: Sponsor Student Organizations Focused on the Energy Industry

### **Challenge #2: Preparing for the Demographic Cliff**

- Proposed Solution 1: Partnerships with the Educational System
- Proposed Solution 2: Collaboration with Workforce Investment Agencies
- Proposed Solution 3: Untapped Labor Pools

### **Challenge #3: Employment and Training Programs**

- Proposed Solution 1: Developing New Training Programs
- Proposed Solution 2: Improving Existing Programs
- Proposed Solution 3: Expanding Successful Models

#### **Challenge #4: Skill Development for New and Incumbent Workers**

- Proposed Solution 1: Transferring Knowledge from the Aging Workforce
- Proposed Solution 2: Community College-Business Internships
- Proposed Solution 3: Identify industry knowledge necessary to transfer from retiring workers to new workers

#### **Next Steps**

ETA supports comprehensive business, education, and workforce development partnerships to develop innovative approaches and replicate models that effectively serve the workforce needs of business while helping workers find good jobs with good pay and promising careers.

Based on the challenges identified by the energy industry and highlighted in this report, ETA made a series of investments totaling over \$27 million to address industry workforce needs. The demonstration projects address the needs of the industry broadly as well as specific sub-sectors.

The next steps in this process include the implementation of these demonstration projects and then sharing the successful models with the public workforce investment system so that their replication by other energy industry partnerships may ensure job growth for this key sector of the American economy.

# Introduction

## The American Workforce

America's labor market is facing a serious challenge stemming from two primary sources: an insufficient supply of people with necessary skills and the "leveling off" of the number of American-born people available for jobs. For example, experts project that the percentage of the workforce with college degrees will grow very slowly.<sup>1</sup> In addition, it is projected that in the next 20 years, there will be virtually no growth in the "prime age workforce" (those between the ages of 25 and 54) and a substantial slowdown in skill growth.

In recent decades, the U.S. has experienced a marked increase in both the size and educational level of its labor force, and as a result, the country has experienced strong economic growth. The depth and breadth of the labor pool has been expanded by large numbers of Baby Boomers, women, and immigrants entering the workforce, as well as large increases in the number of college-educated workers. However, growth in numbers of new and educated American-born workers is ending. In the next 30 years, the number of native-born workers age 35-44 will decrease, while more than 60 million employees are likely to retire.<sup>2</sup> Growth in the labor force will probably be sought from older workers, immigrants, and other underutilized labor pools.<sup>3</sup> The changing demographics of the workforce create new challenges and opportunities for employers.

The economy of the United States, similar to that of other developed nations, is fueled by innovation. In the face of a global economy, employers are using new productivity-enhancing technologies to remain competitive. Two-thirds of America's economic growth in the 1990s resulted from the introduction of new technologies. This continual process of innovation and technological change has resulted in jobs that demand ever-higher skill levels. For example, 60 percent of the new jobs of the 21st century require some post-secondary education. However, currently only one third of America's workforce has this level of education.<sup>4</sup>

## Building a Demand-Driven Public Workforce System

The mission of the Department of Labor's Employment and Training Administration is to contribute to the more efficient and effective functioning of the U.S. labor market by providing high quality job training, employment assistance, labor market information, and income maintenance. These services are provided primarily through state and local workforce investment systems. While the federal government invests \$14 billion annually in workforce development programs, private sector employers and individuals invest far larger amounts in skills training for their workers. ETA is responsible for ensuring that the federal funding is utilized in the most effective manner possible.

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1 D.T. Ellwood. 2001. "The spluttering Labor Force of the 21st Century. Can Social Policy Help?" National Bureau of Economic Research, June 2001.

2 Facts on Immigration, National Immigration Law Center, March 2003. p. 1.

3 The Aspen Institute Domestic Strategy Group. Grow Faster Together. Or Grow Slowly Apart. How will America Work in the 21st Century. p 11.

4 United States, The White House, Better Training for Better Jobs (Washington, DC: 5 April 2004).



ETA exists to provide business, America's economic engine, with the highest quality workers possible, and to link the two together for their mutual benefit. This relationship allows workers to live more productive and prosperous lives and businesses to be more competitive in the global economy, ensuring no worker is left behind. Recognizing the inextricable ties between workforce development and economic development, ETA promotes partnerships among community colleges and other educational institutions, private industry, and workforce and economic development entities.

Capitalizing on the power of partnerships will allow ETA to create a demand-driven approach to workforce development, which focuses the workforce investment system on giving workers readily useable skills, knowledge and information that are most needed by employers, particularly in high-growth occupations like energy. In the past, the U.S. workforce investment system often focused more on the supply of workers than on the demands of the labor market sometimes resulting in workers receiving training for jobs that did not exist. In addition, workers often did not receive the benefits of possessing those skills that were of value and high demand in the marketplace, including higher wages and improved job security. By aligning training programs with the demands of the labor market, the workforce system is helping American businesses to remain competitive in the global economy.

ETA has focused on the following goals to align the workforce investment system more closely with the demands of the labor market: first, to meet the demands of businesses by providing adults, youth, and untapped labor pools with the educational, occupational, and other skills training and services needed to succeed in high demand occupations; and second, to bring together resources devoted to employment, education, and economic development, and use them strategically to create opportunities for workers.

A demand-driven workforce investment system will help the U.S. economy meet the increasing challenges of globalization, changing demographics, and the rapid pace of technological innovation. These challenges make it critical that every available worker be prepared with the necessary skills to join the workforce and contribute to the continued competitiveness of American businesses.

## Demonstrating Solutions: The High Growth Job Training Initiative

While demographic and other trends pose daunting hiring and training challenges for employers, ETA believes these challenges can be overcome through collaborations among key industry stakeholders. ETA believes that successful strategies for workforce development depend on the leadership of industry for development and implementation. Only the leadership and commitment of industry can guarantee that workers are trained to the skills and competencies that are in demand in the labor market.

This initiative represents the first step in a series of actions that the Department of Labor's Employment and Training Administration (ETA) has taken to engage business, education and the workforce investment system to jointly develop solutions to the workforce challenges facing high-growth industries. These industries were selected based on such factors as: employment growth; dramatic workforce transformation; impact on the nation's economic viability and development; and emerging industries. ETA has identified 13 additional high growth industries:

advanced manufacturing, aerospace, automotive services, biotechnology, construction, financial services, geospatial technology, health care, homeland security, hospitality, information technology, retail, and transportation.

ETA conducted a series of Executive Forums under the High Growth Initiative to discuss industry leaders' key workforce challenges, such as current and anticipated demand for workers and skill shortages. Additionally, industry leaders shared their views on worker pipeline capacity, promising workforce practices, and their knowledge of the existing public workforce system at the local, state, and federal levels. Through Workforce Solutions Forums, ETA has worked with a wide array of stakeholders to explore potential solutions to the industries' challenges, and ultimately to invest in innovative partnerships. In this way, the High Growth Initiative promotes an industry-led approach to identify the most critical workforce challenges and develop and implement solutions to those challenges.

The High Growth Initiative seeks to demonstrate how the public workforce system may serve as a catalyst for collaborations among employers, business associations, workers, educators, trainers, community and technical college systems, and economic development organizations. The High Growth Initiative is also a strategic effort to improve the publicly funded workforce system's response to the needs of the labor market by aligning the workforce system to become demand-driven. The purpose of these partnerships is to model how a demand-driven workforce system can more efficiently serve the workforce needs of business, while also effectively helping workers find good jobs at good wages.

By supporting the local workforce system's transformation in becoming demand-driven, ETA is actively promoting workforce quality, enhanced productivity, and economic competitiveness. The ability to respond to evolving labor market demands will require strong, collaborative relationships between the private and public sectors. With its partners, the High Growth Initiative seeks to leverage the publicly funded workforce system to prepare new and incumbent workers with the general and industry-specific knowledge and skills required by employers.

### Additional Resources on the High Growth Job Training Initiative

For additional background information about the industry and details on grants, information about employment and training opportunities, and workforce development tools for employers, educators, and workforce professionals please refer to the following Web sites: [www.doleta.gov/BRG](http://www.doleta.gov/BRG), [www.careervoyages.gov](http://www.careervoyages.gov), [www.careeronestop.org](http://www.careeronestop.org), and [www.workforce3one.org](http://www.workforce3one.org).

# Section I: Background on the Industry and Workforce Issues

## Overview of the Energy Industry and its Sectors

The energy industry employs well over 1 million people nationwide and comprises 4 percent of total Gross Domestic Product (GDP)<sup>1,2</sup>. It plays an integral role in the country's economic and national security. Global demand for energy is projected to continue rising, and energy industry employers will need skilled workers to meet that demand.

ETA included the energy industry in the High Growth Initiative because of the vital role it plays in the U.S. economy and because rapid technological change requires workers to have increasingly sophisticated skills. Businesses involved in the energy industry are among the most ubiquitous in our economy. They obtain the resources necessary to create energy, process or use it as necessary, and deliver energy to all of us, whether it is fuel for our vehicles or power to light our homes and workplaces.

The energy industry's share of U.S. GDP is only the beginning of its influence on the U.S. economy. Without access to sufficient supplies of affordable energy, every other sector of the U.S. economy would grind to a halt. Therefore, a well-trained energy workforce is not a problem that is specific to the energy-industry; it is vital to the nation's economic security.

The average age of workers in the energy industry is now over 50, and the industry estimates that up to half of its current workforce—more than 500,000 workers—will retire within 5 to 10 years. Employers also report that they will need to hire well above replacement levels as new power plants are constructed, new technologies are adopted, mines are opened, and new oil and gas wells are tapped to keep pace with the nation's need for energy.

In many cases, training programs for energy industry careers were scaled back or closed in response to the industry downturn experienced in the late 1980s and early 1990s. Those programs have not reopened or ramped up their capacity at the same rate that the energy industry's need has rebounded. The rapid advancement of technology has added a new challenge to education and training programs, because employers in all sectors of the industry need new workers who are more proficient in math, science, and especially technology than their predecessors.

## Size of the Industry and Projected Growth

The Bureau of Labor Statistics (BLS) does not define energy as one separate, unified industry; it differentiates utilities, mining, and oil and gas extraction as independent industries. The utilities industry includes employers engaged in electricity generation, transmission, and distribution;

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<sup>1</sup> Employment aggregated from the Bureau of Labor Statistics' Career Guide to Industries, sections on mining, utilities, and oil and gas extraction.

<sup>2</sup> Bureau of Economic Analysis, Gross-Domestic-Product-By-Industry Accounts, [http://bea.gov/bea/industry/gpotables/gpo\\_action.cfm?anon=260&table\\_id=17292&format\\_type=0](http://bea.gov/bea/industry/gpotables/gpo_action.cfm?anon=260&table_id=17292&format_type=0)

natural gas distribution; and various water, sewage, and other systems.<sup>3</sup> Mining includes employers in the business of exploring for and extracting coal, metals, and non-metals, as well as initial mineral processing and preparation activities.<sup>4</sup> The oil and gas industry includes employers who find, develop, and extract oil and gas.<sup>5</sup>

Industry representatives typically speak of four broad sectors: 1) oil and natural gas; 2) mining; 3) electric; and 4) renewable energy. Although renewable energy can be considered an independent sector, renewable energy technologies are becoming prevalent in most sectors of the energy industry as well as in other industries such as manufacturing and construction. Likewise, nuclear energy is often classified as a fifth sector by itself because the regulatory framework within which it operates, among several other factors, distinguishes it from the rest of the electric power industry.

Utilizing the BLS structure, the following presents an overview of the three primary energy industry sectors and their expected growth through 2014:

### **Utilities (Fossil and Nuclear Power Generation and Natural Gas Distribution)**

- Workforce: Approximately 523,800
- Projected demand for new workers: Much will depend on whether new power plants are approved. When those plants are approved, the industry estimates it will need at least 21,000 new workers to build them and another 5,000 workers to operate them. Also, the industry expects it will need to replace approximately 25,000 workers nearing retirement.
- Replacement workers: The average age of workers across all U.S. utilities is near 50. Industry studies estimate that nearly half of the current workforce will need to be replaced over the next five years due to retirement or general attrition.

### **Mining**

- Workforce: Approximately 207,000 according to BLS (The Mine Safety and Health Administration's estimate is closer to 350,000.)
- Projected demand: BLS estimates that demand for new miners will decline by 15 percent by 2012, but the industry says that, given projections of continued global demand for energy, it expects the total number of miners to grow by several thousand.
- Replacement workers: Over the next seven years, the industry estimates that it will have to replace half of its workforce.

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<sup>3</sup> U.S. Department of Labor, Bureau of Labor Statistics, "Transportation, and Warehousing, and Utilities Industries at a Glance"  
<http://www.bls.gov/iag/transportutil.htm>

<sup>4</sup> U.S. Department of Labor, Bureau of Labor Statistics, "Career Guide to Industries: Mining"  
<http://www.bls.gov/oco/cg/cgs004.htm>

<sup>5</sup> U.S. Department of Labor, Bureau of Labor Statistics, "Career Guide to Industries: Oil & Gas Extraction"  
<http://www.bls.gov/oco/cg/cgs005.htm>

## Oil and Gas

- Workforce: Approximately 123,000
- Projected demand for new workers: According to BLS, the total number of workers in the oil and gas industry will decline by 28 percent by 2012. The industry has conducted initial surveys that suggest growing need for workers as many current workers near retirement and global demand for energy continues to rise, and new workers will need more sophisticated skills than their predecessors. Industry reports that current labor shortages are most severe in the Rockies and the Appalachians where drilling companies cannot hire enough workers to meet current demand and are sometimes forced to wait up to 12 months after signing a contract to begin drilling a new well.
- Replacement workers: Comprehensive, empirical projections are lacking for replacement workers as well, but, like other sub-sectors of the energy industry, the average age of workers in many oil and gas occupations is nearing 50—particularly in management and other highly skilled occupations.

## Employment and Salaries

As Table One demonstrates, the projected employment growth in the energy industry will cover a broad range of positions from laborers to highly skilled and highly compensated professionals such as engineers and hydrologists. While many of the most highly compensated positions will require college or graduate level education, a number of positions in the skilled trades also offer excellent prospects for high-skill, high wage work. These include electricians, plumbers, industrial machinery mechanics, boilermakers, and computer support specialists. According to BLS, the largest numbers of new positions are laborers and freight, stock, and material movers, which are considered relatively low skilled jobs but the range of positions within that job family is large and shows a number of opportunities for career advancement through apprenticeship, training, or on-the-job experience. As the chart below illustrates, demand for truck drivers in the energy industry is also growing quickly.

**Table 1: Energy Industry Average Hourly Wages 2004  
and Projected Employment Growth in Selected Occupations 2004-2014  
(arranged by Job Title in order of size of projected increase in job openings)**

Job or Position Title	Projected Employment Growth 2004 - 2014		Average Hourly Wages 2004		
	Percent	Job openings (1000s)	Bottom 10%	Median	Top 10%
Laborers and freight, stock, and material movers, hand	10.2	1,042	\$7	\$10	\$16
Truck drivers, heavy and tractor-trailer	12.9	507	\$10	\$16	\$24
First-line supervisors/managers of construction trades and extraction workers	10.9	209	\$15	\$25	\$40
Electricians	11.8	207	\$12	\$20	\$34
Plumbers, pipefitters, and steamfitters	15.7	193	\$12	\$20	\$34
Computer support specialists	23.0	183	\$12	\$20	\$33
First-line supervisors/managers of production and operating workers	2.7	173	\$13	\$22	\$35
Welders, cutters, solderers, and brazers	5.0	125	\$10	\$15	\$22
Civil engineers	16.5	77	\$21	\$31	\$47
Electrical and electronic engineering technicians	9.8	56	\$14	\$23	\$33
First-line supervisors/managers of helpers, laborers, and material movers, hand	8.1	55	\$11	\$19	\$29
Electrical engineers	11.8	49	\$23	\$35	\$53
Electrical power-line installers and repairers	2.5	36	\$14	\$24	\$33
Civil engineering technicians	14.1	33	\$12	\$19	\$28
Excavating and loading machine and dragline operators	8.0	30	\$10	\$15	\$26
Surveyors	15.9	28	\$12	\$21	\$35
Environmental scientists and specialists, including health	17.1	26	\$15	\$25	\$42
Environmental engineers	30.0	23	\$20	\$33	\$48
Hazardous materials removal workers	31.2	22	\$10	\$16	\$27
Maintenance workers, machinery	2.8	22	\$10	\$16	\$25
Pipelayers	9.9	21	\$9	\$14	\$25
Mechanical engineering technicians	12.3	16	\$14	\$21	\$32
Occupational health and safety specialists	12.4	14	\$15	\$25	\$39
Separating, filtering, clarifying, precipitating; & still machine setters, operators, & tenders	1.6	13	\$10	\$16	\$25
Chemical engineers	10.6	12	\$24	\$37	\$54
Environmental science and protection technicians, including health	16.3	12	\$11	\$17	\$27
Control and valve installers and repairers, except mechanical door	4.9	11	\$12	\$21	\$31
Stationary engineers and boiler operators	3.4	11	\$13	\$21	\$32
Roustabouts, oil and gas	1.0	10	\$8	\$12	\$19
Environmental engineering technicians	24.4	9	\$12	\$19	\$31
Boilermakers	8.7	8	\$14	\$23	\$33
Nuclear engineers	7.3	6	\$30	\$42	\$57
Hydrologists	31.6	4	\$19	\$29	\$45

## Education and Training in the Energy Industry

Employers in the energy industry hire workers with a wide range of skills and educational backgrounds. Many entry-level occupations still require little or no previous training, but the increasing complexity of technologies used by the industry and stringent safety requirements have led to a greater number of employers seeking workers with documented skills. Those who enter the industry directly from high school usually start as laborers or in other low-skilled occupations. Significant advancement is possible for entry-level workers who master progressively more complex skills acquired through on-the-job-learning such as apprenticeship, which is often combined with classroom learning as well as learning directly on the job from more experienced workers at the work site.

Due to the increasingly complex nature of the equipment used, workers above the laborer level (such as technicians) usually require some form of technical training. Workers often obtain that training through a certificate program or a two-year associate's degree or, in some occupations, apprenticeship. Throughout the industry, safety training is a key competency requirement for nearly all occupations and is learned on the job, through formal education, and through safety orientation training conducted before new recruits begin working.

Managerial personnel in the energy industry typically have significant experience in their field and/or a college degree. Individuals who enter the industry with a college degree may begin their career path on a management track, but in some areas of the industry it is not uncommon for degreed professionals to enter the industry as technicians.

## Section II: The High Growth Job Training Initiative Process

Prior to launching the initiative for the energy industry, key workforce and business leaders were identified and invited to partner with ETA to address the workforce challenges faced by the industry. The commitment to engage industry leaders and document their workforce challenges is a fundamental underpinning of the High Growth Initiative.

The High Growth Initiative proceeded through three phases: 1) information gathering through industry forums on the state of the industry, including identification of workforce challenges; 2) analysis of industry workforce challenges and soliciting proposed solutions from industry stakeholders; and 3) implementation of demonstration projects to highlight and test proposed solutions.

### Information Gathering and the Executive Forums

An environmental scan of the energy industry was conducted to create an economic and employment picture of the industry and to identify policy and legislative issues, key associations and labor organizations, and interaction with the public workforce system. To validate and complement the information gathered for the environmental scan, Assistant Secretary of Employment and Training Emily Stover DeRocco met with energy industry leaders over the course of a year to gather pertinent information on their critical workforce issues. Through the forums, Assistant Secretary DeRocco had the opportunity to share ETA's plans to meet skilled workforce needs and to secure a commitment from leading energy industry employers to continue working in partnership with ETA.

The first Executive Forum was held in Washington, D.C., on July 15, 2004. The forum was scheduled as a part of the Nuclear Energy Institute's annual board meeting and was attended by NEI member companies representing the majority of the U.S. nuclear power generating capacity as well as by their suppliers. Among the companies represented were AREVA/Framatome ANP, Entergy Nuclear, Exelon, and First Energy Nuclear Operating Company.

The second Executive Forum was held in Washington, D.C., on September 14, 2004. This forum was attended by chief executive officers, executive level officers, and executive leadership of utility companies. Among the companies and associations represented were Southern Company Generation, Edison Electric Institute, American Gas Association, PPL Corporation, Keyspan, UGI Utilities, American Public Power Association, and Wisconsin Public Service Corporation.

The third Executive Forum was held in Las Vegas, Nevada, on October 15, 2004. The forum was scheduled as a part of the mining industry's annual trade show, MINExpo, and was attended by member companies of the National Mining Association. Executives in attendance represented companies engaged in all sub-sectors of the U.S. mining industry. Among the companies represented were Alliance Coal, Arch Coal, Cleveland Cliffs, Consol Energy, DBT



America, Foundation Coal, Kennecott Minerals, Kennecott Energy, Newmont Mining, Bucyrus Intl., Stillwater Mining Co., Natural Resource Partners, and Drummond Company.

The fourth Executive Forum was held in Pasadena, California, on October 15, 2004. The forum was scheduled as a part of the American Petroleum Institute's annual meeting. Executives in attendance represented companies engaged in all aspects of the U.S. oil and gas industry. Approximately 100 executives from API member companies were in attendance.

The fifth and sixth Executive Forums were held in Austin, Texas, on October 26-27, 2004. ETA hosted two separate forums scheduled as a part of the Independent Petroleum Association of America's annual meeting. Executives in attendance represented companies and state-based associations whose members are engaged in all aspects of the upstream segment of the U.S. oil and gas industry.

A seventh Executive Forum was held in Charleston, West Virginia, on March 31, 2005. The forum was attended by Appalachian region coal mining executives.

During the Executive Forums, industry leaders identified several key challenges, which are outlined in the following section, and pledged their support to further assist the initiative. The executives also learned about the public workforce system, the demand-driven vision to make the system more responsive to industry's needs, and how the system can be used to provide valuable employment services and training.

## Analysis of Energy Industry Challenges and the Workforce Solutions Forum

ETA invited industry employers, education and training providers, and representatives of the public workforce system to a Workforce Solutions Forum on December 14 – 15, 2004 in Houston, Texas, to develop innovative solutions to address the industry's workforce challenges. A proposed solution is an innovative workforce development strategy or model that must demonstrate positive outcomes that can be implemented, sustained and replicated at the local, regional or national level. Participants worked in groups to brainstorm and prioritize innovative workforce solutions, propose foundational models, and document the critical attributes, key stakeholders, necessary resources, implementation barriers and other pertinent information in a "solutions matrix" to guide ETA's investments in high-growth industry strategies.

Each working group focused on one of four key workforce areas: 1) Image and Recruitment, 2) Preparing for the Demographic Cliff, 3) Education and Training Programs, and 4) Skill Development. Facilitators trained in the Nominal Group Technique<sup>6</sup> led the discussions. The three groups clarified the workforce challenges they were addressing, brainstormed innovative solutions, used a voting procedure to prioritize the top solutions, and broke into sub-groups that developed potential solutions to the workforce challenges. By the end of the day, a wide range of solutions were identified, and 22 solutions were documented in detail on solutions matrices.

The workforce challenges identified at the executive forums and the approaches and strategies proposed at the workforce solutions forum are detailed in the next section.

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<sup>6</sup> Randall B. Dunham, Ph.D., Nominal Group Technique: A Users' Guide, University of Wisconsin, <http://instruction.bus.wisc.edu/obdemo/readings/ngt.html>.

# Section III: Workforce Challenges and Solutions in the Energy Industry

## Workforce Challenges Identified by Industry

Although most energy industry careers pay well, the industry faces several challenges in recruiting and training a sufficient number of workers. ETA met with representatives from over 100 energy companies from each of the sectors mentioned earlier in a series of executive forums to identify workforce challenges facing the energy industry and to develop potential solutions to those challenges. Forum attendees identified a range of key workforce challenges.

- Employers expect that up to half of their current workers will retire over the next 5 to 10 years.
- Stereotyping of energy careers as unstable, dangerous, and low-skilled causes qualified workers, especially youth, to be unaware of the many highly skilled, well-paying career opportunities the industry offers.
- Many training programs were reduced or eliminated during the downturn the industry experienced in the late 1980s and early 1990s. Programs have not expanded at the same rate that the industry's need has rebounded.
- Employers in all sectors of the industry need workers who are more proficient than their predecessors in math, science, and, especially, technology skills.
- Creative solutions are necessary to help experienced workers who will be retiring transfer their knowledge and skills to their replacements and to help new workers gain necessary skills as quickly as possible.
- Too few industry-defined, portable credentials have been developed in the energy industry. Additionally, some energy occupations lack clearly recognizable career ladders necessary for instilling a new perception that working in the industry is an attractive and viable long-term career choice.

The energy industry executive and solutions forums focused on four key challenges and solutions that are discussed in the remainder of this section.

### Challenge 1: Image & Recruitment

One reason the industry has difficulty hiring people in sufficient numbers is that many job seekers do not investigate career opportunities in energy because of its poor public image. Many students do not explore careers in energy because they anticipate tough working conditions and inadequate safety standards at the work site. For example, industry recruiting personnel report that perceptions of the energy industry's skill requirements, safety standards, career ladders, and environmental practices are based on antiquated stereotypes. Among others, audiences for whom the industry's image needs to be improved include youth, parents, educators, and guidance counselors. Youth often choose career paths at a very young age; therefore, improving their parents,' teachers,' and guidance counselors' understanding and perception of opportunities in

the energy industry could enhance the industry's recruiting efforts. Additionally, partnerships with colleges and trade schools could help dispel misconceptions and enlighten students regarding the many occupations that are available within the energy industry.

### **Proposed Solution 1: National Marketing Campaign to Improve the Industry's Image**

Solutions Forum attendees suggested the industry's image could be improved through a national or regional advertising/recruitment campaign. This effort would attempt to increase broad public appeal of the energy sector and leverage community relationships with the industry. It would need to begin with market research and engagement of the energy industry through employers, industry associations, and those federal agencies that have regulatory oversight over energy industries or sectors. The campaign's goal would be to educate the public about the nature and importance of the industry and to raise awareness about the career opportunities it offers. Such a campaign would likely be expensive and would require a financial commitment from employers, energy foundations, and one or a number of relevant federal agencies. Success would also require addressing concerns of the environmental community, including the EPA, which are perceived as contributing to the bad image of the industry.

### **Proposed Solution 2: Sponsor Student Organizations Focused on the Energy Industry**

Attendees also believed the industry's image can be positively impacted through developing new formal student organizations focused on the energy sector (such as Students for Engineering, Exxon Young Scientist Initiative, and Student Clean Energy Committee). Solutions Forum attendees thought it would be helpful to develop a national model or national resources but to permit flexibility to accommodate local needs. Success would require the buy-in of the education system and strong commitment and leadership from local energy partners, national industry associations, and labor unions that serve workers in the industries.

## **Challenge 2: Preparing for the Demographic Cliff**

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

### **Proposed Solution 1: Partnerships with the Educational System**

Solutions Forum attendees stressed that to replace workers lost to retirement, the energy industry must ensure it has a qualified pool of applicants from which to recruit. Attendees believed partnerships with community colleges, vocational technical

institutions, and four-year universities must be strengthened to prepare students to enter the industry's recruitment pipeline. Closer partnership would allow for the energy sector's participation in curriculum development, matching students' learning to employers' specific skills and competencies requirements. Additionally, corporate partnerships can provide funding for needed equipment, materials and education assistance at financially strapped educational institutions.

### **Proposed Solution 2: Collaboration with Workforce Investment Agencies**

Attendees believed establishing partnerships with workforce investment boards would strengthen the communication of industry needs and standards between energy employers and educational institutions or programs. This solution would allow all parties to identify and replicate best practices to ensure candidates are prepared for energy industry demands. Collaboration with the workforce investment system, specifically One-Stop Career Centers, would enable employers to inform more people about energy career opportunities as well as leverage the workforce system's ability to screen potential candidates, which saves time and money for employers.

### **Proposed Solution 3: Untapped Labor Pools**

One strategy attendees suggested for expanding the pipeline of new workers is creating an industry approach to attracting a diverse pool of candidates. This requires that energy stakeholders, institutions, and workforce investment boards engage in outreach to people and communities that are underrepresented in the current energy workforce. For example, stakeholders could include the development of training materials in English as a second language format and use them in conjunction with on-the-job-training or internships. Outreach can also be geared towards other non-traditional groups such as transitioning military personnel and women who are underrepresented in the energy industry.

## **Challenge 3: Education and Training Programs**

Training providers' capacity to train workers with the skills needed for today's energy careers has not kept pace with needs. For example, in one instance, industry representatives reported that new recruits at the technician level are in such short supply that graduates from the only available two-year technician degree program in their area receive starting salary offers of \$60,000 per year. Similar demand has also driven salaries rapidly upward for degreed engineers. Attendees at the Workforce Solutions Forums agreed that new training programs must be developed, existing programs must be improved, and successful training models must be replicated to improve the capacity of training providers to meet the energy industry's rapidly evolving workforce needs.

Energy industry employers have historically pursued widely varying strategies to train their workers. Some have relied heavily on partners from the education system, while others have chosen to internalize the majority of their training or to rely on labor unions. Programs previously closed or scaled back have not reopened or expanded sufficiently to meet growing industry needs.

Additionally, technology's rapid advancement adds a new challenge to education and training programs, because employers in all sectors of the industry need workers who are more proficient in math, science, and especially technology, more so than workers needed in the past. In contrast to most people's perceptions, many miners now need computer skills to perform their job. Likewise, in both nuclear and fossil fueled power plants, workers need technical skills to operate highly automated and sophisticated equipment. The same is true for workers in many oil and gas industry occupations.

### **Proposed Solution 1: Developing New Training Programs**

Energy industry stakeholders need innovative programs to train students, entry-level, and incumbent workers to ensure preparation and production of a skilled workforce. Basic education, skill requirements, and training can be provided through an array of technologies making training portable to a number of demographic groups. Solutions Forum attendees believed new partnerships between the energy sector, schools, workforce investment boards and government agencies are needed. Such partnerships could establish a defined skill set of certification modules and make them available on compact disc or the Internet in real time instruction providing delivery to students wherever they may be located.

### **Proposed Solution 2: Improving Existing Programs**

In cases in which training programs already exist, attendees suggested they may need to be updated to reflect more modern industry practices and skill requirements. For example, the oil and gas industry is now able to extract oil from sea floors at depths once thought unreachable. This development also suggests that training programs be geographically located in or near locations where there is significant demand for energy labor. Such an effort requires broad engagement with industry, government, and education networks nationally and through a formal structure. Updated industry standards can also be identified through community partnerships. All stakeholders must cooperate to develop updated curriculum that meets the industry's current needs.

### **Proposed Solution 3: Expanding Successful Models**

Attendees believed existing successful, industry-led training solutions must be replicated or expanded. Expanding opportunities for internships, cooperatives, and apprenticeships will address specific challenges the industry faces in recruitment, retention, and training. Such efforts will provide hands-on training through use of curriculum developed to meet the industry's international, national, and regional certification standards. Programs will attract a broad base of new and incumbent workers and increase bilingual curriculum as regionally appropriate.

## **Challenge 4: Skill Development**

Individuals entering the workforce too often lack the foundational math and science skill sets they need to be successful in the energy industry. This creates an insufficient labor pool from which industry is able to recruit new workers. Employers incur considerable costs in training incumbent workers who lack skills needed to adapt to evolving technologies. Education providers such as community colleges are well-positioned to help alleviate this problem. Additionally, as large numbers of experienced workers retire, strategies are needed to transfer

their knowledge to the next generation of energy workers. Executives also noted a need for developing competency models and career ladders for the energy industry.

### **Proposed Solution 1: Transferring Knowledge from Aging Workforce**

Solutions Forum attendees believed that to solve the knowledge transfer problem, companies must identify groups of workers with critical skills who are likely to retire and implement a mentoring process whereby older workers can directly impart their knowledge and expertise to younger workers. This would involve developing a systematic approach to capture and catalog key knowledge elements. Older workers could then be recruited as trainers or mentors. The activities could be linked to the broader transition and implementation of a program of culture and generational change. With broadened scope, a mentoring process could facilitate the knowledge transfer process by collaborating across an industry and focusing on a common skill set.

### **Proposed Solution 2: Community College-Business Internships**

Attendees believed this solution would consist of developing partnerships with community colleges to construct a program that combines classroom training with internships. Interns would gain hands-on experience by shadowing an older worker/mentor through a number of activities. This strategy's effectiveness would depend on the willingness of employers to release older worker/mentors to engage in this activity and on the quality of the mentor's knowledge and skills. Mentors would also need to be willing to respond with on-call consultation, providing help and instruction to newer workers who are able to function independently but would benefit from having a designated mentor. Successful completion of the internship and classroom learning would result in an offer of employment.

### **Proposed Solution 3: Identify the knowledge necessary to transfer skills**

This solution would require a number of approaches to documenting and storing knowledge companies need to preserve in a variety of formats and media. Attendees stressed that this solution should not be location bound, e.g., video conferencing would allow world-wide mentoring. It could involve the whole industry as well as specific work-sites and equipment. This would require a strong business case for encouraging companies to collaborate and clear evaluation metrics to define and confirm success.

Attendees said identifying knowledge for transfer must include multiple means to capture older workers' institutional and technical knowledge via electronic means and could involve the creation of Web sites and delivery of PC training. Additionally, their knowledge could be transferred to Web sites and/or videos. The image of a chat room was suggested. The media could be archived to achieve maximum utilization.

## Section IV: Implementation of Solutions and Next Steps

Grants awarded under the High Growth Job Training Initiative implement unique and innovative, industry-driven skills training, certification and career ladder development programs that support identified energy industry workforce and economic development needs. Based on the challenges identified by the energy industry and highlighted in this report, ETA has made a series of 11 investments since 2003 totaling over \$27 million to partnerships among business, community colleges, the public workforce investment system and other entities that have developed innovative approaches to meet workforce needs while effectively helping workers find good jobs with good wages and promising career pathways.

The following section highlights ETA's investments, which are intended to provide genuine solutions, leadership, and models for partnerships that can be replicated in different parts of the country. ETA is committed to identifying successful models and resources through the High Growth Job Training Initiative in energy and sharing them with the public workforce system. Additional information on ETA investments is available at: <http://www.doleta.gov/brg>.

### **High Plains Technology Center**

This is a \$1,546,463 grant to develop and provide at least 50 industry-driven courses for new and incumbent workers in the upstream oil and gas industry. Courses were developed in both English and Spanish, and in less than two years, High Plains Technology Center exceeded its initial goal and trained 1,703 workers in oil and gas extraction technologies. (\$528,623 in leveraged funds)

### **San Juan College Regional Training Center**

A \$2,113,127 grant to San Juan College sought to provide hands-on training opportunities for entry-level workers in the upstream oil and gas industry. All training materials developed were translated into both Spanish and Navajo and trainers are bilingual. Over the past two years, 5,600 workers were trained and the placement rate exceeds 95 percent for those who were unemployed when they began training. (\$2,500,000 in leveraged funds)

### **Alaska's High Growth Job Training Initiative for Energy**

This is a \$7,000,000 grant to increase Alaska's capacity to meet the state's workforce needs by targeting investment of workforce development resources on partnerships focused on training for energy-related occupations; integrating vocational and technical education with skills training to provide students and workers the tools they need to obtain jobs; increasing apprenticeship training and employment skills for energy-related jobs; and finally, fast tracking the public workforce system's change to a market-driven, industry centered one-stop system that is responsive to state and local economic needs. (\$1,100,000 in leveraged funds)

### **College of Eastern Utah Regional Energy Training Center**

This is a \$2,737,804 grant to establish a center that trains workers for careers in the oil and gas, utilities, and mining industries. The grantee will develop foundational courses to teach skills common across the energy industry and offer additional training tailored to specific sectors of the industry. Courses will be offered to Hispanic and Native American populations in their native languages. (\$3,197,376 in leveraged funds)

### **Oklahoma Department of Career and Technical Education**

This is a \$2,363,539 grant to expand High Plains Technology Center's (HPTC) successful Mid-Continent Oil and Gas Training Center in Woodward by establishing satellite centers throughout Oklahoma and neighboring states. This expansion will include the development of new courses in the areas of drilling, well servicing, production and off-road driving. HPTC's strong partnership with oil and gas companies assures that training will meet industry standards. (\$565,593 in leveraged funds)

### **Kentucky's Demand Driven Response to the Coal Industry's Workforce Crisis**

This is a \$3,025,260 grant to develop expedited, employer-driven, coal-mining training options for new recruits and incumbent workers using experience on mining simulators, distance learning, and a mobile classroom. The West Kentucky WIB and Eastern Kentucky Concentrated Employment Program, in concert with industry and the Kentucky Community and Technical College System, will develop a new pipeline of workers by better educating students and workforce system customers about high-paying careers in coal mining. (\$7,100,000 in leveraged funds)

### **Pennsylvania State University**

This is a \$503,210 grant to develop an Associate of Engineering Technology Degree in Mining Technology to meet local employment needs. The program will give students the opportunity to learn to operate today's sophisticated mining equipment through the use of simulators. This approach also will enable workers to learn valuable safety skills before entering the mining work environment. (\$572,670 in leveraged funds)

### **West Virginia University Mine Training and Placement Center**

This is a \$3,000,000 grant to establish a Mine Training and Placement Center with two campuses, one at West Virginia University and the other at Southern West Virginia Community and Technical College. The Center will provide traditional classroom instruction with an expanded curriculum that incorporates practical experience in equipment operation through the use of simulators. Training also will be provided in mine support and construction tasks and new workers will gain exposure to mine electrical, hydraulic and maintenance systems. (\$544,333 in leveraged funds)

### **The University of Missouri-Columbia**

This is a \$2,305,995 grant to establish a Center of Excellence for Radiation Protection Technology Education and Training. The Center will develop, pilot, and disseminate an Associate of Applied Science Degree in Nuclear Technology program. Graduates will be hired in nuclear power plants and national laboratories. (\$1,172,053 in leveraged funds)



### **Wyoming Department of Workforce Services**

This is a \$2,400,000 grant that will train 1,500 workers for the Rocky Mountain oil and gas industry by establishing an industry-driven basic safety training program for new workers. Trainees will acquire the skills and hands-on experience they need by training in a 76 acre simulated oil and gas field. Safety training for heavy equipment operators, truck drivers, crane operators, and safety coordinators will be implemented as well. (\$2,907,000 in leveraged funds)

### **Center for Energy Workforce Development (CEWD)**

This \$98,270 grant will develop Web-delivered tools that will enable workforce professionals and job seekers to become more familiar with specific energy occupations, specifically, utility career opportunities in their area. A career assessment tool will help job seekers assess their skills and aptitudes, aligning them with specific opportunities in the utilities industry. The CEWD Web site will provide linkages to utilities-specific competency models, making them readily accessible to anyone developing utilities solutions and thus profoundly increasing their usefulness. (\$401,970 in leveraged funds)

## **Conclusion**

The energy industry is vital to the American economy and to our national security. We take for granted we can simply flip a switch to turn on our lights or that the corner gas station will always have gas. The men and women who ensure the energy we need is available to us go largely unseen, but their work is critical to our way of life. Other industries also depend on the energy industry to achieve their mission. No construction project could be completed, no product could be manufactured, and no hospital could operate without access to energy. The energy industry faces a variety of challenges, however, in finding, training, and retaining the workforce that all of us rely on.

ETA has invested in a variety workforce partnerships through the High Growth Job Training Initiative. The investments were made after working with industry leaders to define the key challenges they face. The projects demonstrate how a demand-driven workforce system can more effectively meet employers' needs and help workers launch rewarding and well-compensated careers.

These investments only represent the first step in ETA's ongoing commitment to the energy industry. ETA is committed to continuing to identify successful models and resources through the High Growth Job Training Initiative and sharing them with the workforce system. Broadly disseminating successful tools and resources for meeting the workforce challenges of the energy industry will help all of us ensure that we have the energy to fuel a vibrant economy.