Chapter 7

The Workforce Challenge

1. SUMMARY

The coal mining sector will face significant challenges in meeting its needs for workers between now and 2030. Although many of these challenges are similar to those that other industries and countries face with the retirement of the current Baby Boom Generation, the projected increases in U.S. coal production will also create additional demand for new workers. To meet the need for an expanding workforce, the safety and reputation of the coal industry, potential movement of the workforce to and from the coal sector, competitiveness of salary and benefit programs, human resource development cultures, and limitations on education and training resources must be considered. This chapter discusses the major workforce issues and challenges, presents workforce projections to the year 2030, and offers recommendations and action plans for the coal mining sector at large.

The current coal mining workforce of approximately 90,000 is a well-paid cadre of professionals that fulfills a number of different jobs and tasks. Using Energy Information Administration (EIA) productivity and production projections (EIA, 2006a), 21,000 additional coal mining workforce positions will be needed in the various coal producing regions of the United States by the year 2030. Accounting for retirement and turnover of the existing workforce, almost 45,000 new miners will be needed in the coal sector. Assuming and applying conservative retention rates, about 64,000 new entrants to the industry must be recruited and trained by the year 2030 to achieve projected production targets.
Although it is clear that the projected manpower increase is reasonable, it is unclear how it will be realized. New incentives may be necessary to recruit employees from other industry sectors and non-coal mining areas. Different recruitment and trainings needs and strategies will be necessary for different categories of employees. Educational and training resources will place some limits on the availability of some of these professionals. Furthermore, new vocational programs will be necessary and will play a significant role in meeting the needs of the coal sector.

2. INTRODUCTION

Over the next 20 to 30 years, workforce education and training issues may have the most significant impact on U.S. coal production. The coal industry, like most mining sectors, has greatly increased mechanization and automation, which has led to high levels of productivity and a marked decrease in the need for labor to produce coal. However, projected increases in production between now and 2030, coupled with the graying of the American labor force, will result in a shortage of workers in every category. With the enormous loss of mining and technical skills in the mining industry, the recruiting of workers and the staffing of mines to keep the system together and functioning will be a difficult challenge. In addition, the educational and training resources are not currently in place to bridge the gap.

To recruit and retain the necessary workforce and meet the new production levels requires changes in the training, education, and corporate culture infrastructure. In particular, the case of technical workforce availability and competitiveness of the U.S. economy is a matter of national concern. In the recent report, *Rising Above the Gathering Storm*, a National Research Council committee addressed the issue of the eroding technical workforce and the need for the nation to focus on science and technology in meeting the nation’s needs, including “affordable energy” (NRC, 2007c). The committee recommended significant increases in funding for science and technology education and research to ensure that the U.S. economy remains competitive in the world market. The coal sector is a prime example of a basic industry that can benefit from such recommendations.

2.1 Coal Mining Workforce

Data obtained from the National Mining Association (NMA), based on the Bureau of Labor Statistics (BLS) census, estimated that the 2,113 coal mining operations in the United States employed 85,693 individuals in 2006. Contractors servicing the coal mining sector employed an additional 37,281 individuals. According to employment data on information from the Part 50 database, which is collected from the industry by the Mine Safety and Health Administration (MSHA) and compiled by the National Institute of Occupational Safety and Health (NIOSH), the coal sector workforce was 91,867 in 2005. This discrepancy is due to differences in data definitions and collection methods. Figures suggest that about 30 percent of the mining workforce are contractor employees who perform different functions from mine to mine. With the pressures on hiring replacements for retiring miners and ramping up operations, experienced contractor employees have been hired at a greater pace.
BLS indicated that the average wage for coal miners in 2006 was $66,601—over 150 percent of the U.S. national average of $42,405 (Table 7.1). This difference is even more pronounced in five coal-producing states (Montana, New Mexico, North Dakota, West Virginia, and Wyoming) where coal mining sector employees earned more than twice the statewide average for all industries.

### 2.2 Professional, Skilled, and General Labor

There are demographic, education, salary, and other differences among employees, depending on the type of position they occupy in the coal industry. Within the coal mining sector, as in many other industrial sectors, various categories can be used to classify the total workforce. The following categories were identified from information received from operating coal companies: managerial and sales, professional (such as engineers and geologists), technical (including administrative personnel), tradesperson (such as electricians, plumbers, and mechanics), skilled workers (such as continuous miner and dragline operators), and laborers. The last four categories are also referred to as coal production workers.

The proportions of personnel in each of these categories can vary widely based on the size of the company, the type of mining operation (surface or underground, large-scale or small-scale), and the overall corporate structure. Table 7.2 illustrates the proportion of the workforce in different job categories from data obtained by two coal producers. Not all companies use all categories, and may classify skilled labor and tradespersons differently, as reflected in Table 7.2.

These workforce distinctions are important because of differing trends in the retention rate, age distribution, and retirement age of employees.

#### TABLE 7.1 Annual coal mining wages vs. all industries, 2006.

<table>
<thead>
<tr>
<th>TOP STATES</th>
<th>MINING (AVERAGE)</th>
<th>ALL INDUSTRIES (AVERAGE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>$64,577</td>
<td>$35,520</td>
</tr>
<tr>
<td>Colorado</td>
<td>$70,558</td>
<td>$43,664</td>
</tr>
<tr>
<td>Indiana</td>
<td>$67,855</td>
<td>$36,610</td>
</tr>
<tr>
<td>Kansas</td>
<td>$80,499</td>
<td>$36,191</td>
</tr>
<tr>
<td>Kentucky</td>
<td>$59,815</td>
<td>$34,922</td>
</tr>
<tr>
<td>Maryland</td>
<td>$49,751</td>
<td>$44,527</td>
</tr>
<tr>
<td>Montana</td>
<td>$66,403</td>
<td>$29,386</td>
</tr>
<tr>
<td>New Mexico</td>
<td>$75,606</td>
<td>$33,409</td>
</tr>
<tr>
<td>North Dakota</td>
<td>$73,551</td>
<td>$31,023</td>
</tr>
<tr>
<td>Ohio</td>
<td>$55,700</td>
<td>$38,105</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>$65,384</td>
<td>$41,013</td>
</tr>
<tr>
<td>Texas</td>
<td>$75,886</td>
<td>$43,269</td>
</tr>
<tr>
<td>Utah</td>
<td>$62,666</td>
<td>$34,727</td>
</tr>
<tr>
<td>Virginia</td>
<td>$59,931</td>
<td>$43,666</td>
</tr>
<tr>
<td>West Virginia</td>
<td>$64,801</td>
<td>$31,999</td>
</tr>
<tr>
<td>Wyoming</td>
<td>$73,689</td>
<td>$36,272</td>
</tr>
</tbody>
</table>

Average wage for all U.S. coal miners: $66,601
Average wage for all U.S. workers: $42,405


#### TABLE 7.2 Distribution of the coal mining workforce.

<table>
<thead>
<tr>
<th>COMPANY TYPE</th>
<th>POWDER RIVER BASIN PRODUCER</th>
<th>EASTERN PRODUCER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production (million tons)</td>
<td>138.1 (100% Surface)</td>
<td>24.8 (42% Surface)</td>
</tr>
<tr>
<td>Production (percent U.S. total)</td>
<td>11.9%</td>
<td>2.1%</td>
</tr>
<tr>
<td>Total workforce</td>
<td>2,324</td>
<td>3,666</td>
</tr>
</tbody>
</table>

**WORKFORCE DISTRIBUTION**

<table>
<thead>
<tr>
<th>Category</th>
<th>Company Type 1</th>
<th>Company Type 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Managerial</td>
<td>1.8%</td>
<td>17.1%</td>
</tr>
<tr>
<td>Professional</td>
<td>2.2%</td>
<td>3.1%</td>
</tr>
<tr>
<td>Technicians</td>
<td>4.9%</td>
<td>7.0%</td>
</tr>
<tr>
<td>Tradespersons</td>
<td>26.9%</td>
<td>*</td>
</tr>
<tr>
<td>Skilled Labor</td>
<td>62.6%</td>
<td>69.5%</td>
</tr>
<tr>
<td>General Labor</td>
<td>1.5%</td>
<td>3.2%</td>
</tr>
</tbody>
</table>

* Included in other categories
within each category. Training and education needs, corporate work life strategies, and other factors may also be extremely different among people in other classifications.

2.3 Alarming Aging and Demographic Trends

Coal mining, like all other industrial sectors in the United States, is facing the aging of the workforce at every level. Based on BLS (2007) data for 2006, 54 percent of the coal mining workforce is over 45 years of age, the median age is 46.6 years, and the mean age is over 50. According to Toossi (2007), Baby Boom Generation retirements will limit the growth in the labor force over the next 40 years. The age of coal mining employees is generally higher than for other commodity sectors, but the overall distribution is similar. Figures 7.1 to 7.4 depict the age distribution within the coal workforce nationally and in the three coal-producing regions, as defined in Figure 1.3. These figures indicate that the mean age of U.S. coal miners is 51, supporting a recent projection by Quillen (2008) that the mean age of coal miners is 50 and the median work experience is 20 years.

Over the next five years in the United States, retirement of senior managers across industries is estimated as high as 50 percent. Overall, studies report that over 46 percent of all workers in the utility industry are expected to retire in the next five years.
10 years (ScottMadden Management Consultants, 2007). Other studies have shown that 55 percent of the salaried workforce will retire in the next five to seven years (American Petroleum Institute, 2005).

These demographics are similar to those in related industrial sectors and for mining industries in other countries. For example, a 2005 report on the Canadian mining industry noted that over 50 percent of the mining workforce was between 40 and 54, an age group that represents only 39 percent of the total Canadian workforce (MITAC, 2005). A more recent study in Australia also identified strong growth in older workers within the mining sector in that country (Lowry et al., 2006). As in the United States, projections indicate increased retirement rates starting in 2007, when the Baby Boom Generation begins to reach 65. Similar demographics are reported in other U.S. energy-serving sectors as well (ScottMadden Management Consultants, 2007).

2.4 Recruitment and Training Challenges

Coal mining is perceived as a cyclic and dangerous occupation. In many mining communities, young people are discouraged by family, schools, and the community from entering coal mining. It is also suggested that high school students in coal communities, unlike the generation now retiring, are more inclined to choose careers that are less physically demanding (Joe Main, UMWA, retired, pers. comm., 2008). Although some companies have reported a strong pool of job applicants following the recent tragic incidents (Laws, 2006), the rash of fatalities at coal mines in 2006 and 2007 has probably reinforced perceptions of the industry safety, making it increasingly difficult to recruit and retain a quality cadre of new employees in the industry. Recently enacted statutes on coal mine safety have created additional requirements for training, safety equipment, and procedures that present hurdles for new employees.

Another challenge is the reputation of the industry as rather low-tech and the occupation as physically labor-intensive. The opportunity for use of technology and upskilling is often assumed limited. As these are important factors for younger employees entering the workforce, the low-tech reputation of the coal mining industry is another barrier to recruitment. Many entry-level employees may be engaged in general labor categories, or in jobs that involve less-complex tasks, which may reinforce their perceptions that mining is low tech and may lead to lower retention rates.

The in-depth new miner training, mine maintenance, electrician, equipment operator, supervisory, and other training and educational programs that existed through company, academic, and government support virtually disappeared during the market decline of the late 1970s and have not been replaced. The few programs that are in place today appear to be developed by the major coal companies to mainly benefit that particular company’s mines. Companies on the other end of the
spectrum (i.e., smaller companies, contract mining operations, and contractors performing mining activities at coal mines), with limited resources, may be resorting to staffing mines with employees that have rather limited experience and training.

2.5 The Potential “Transfer” Workforce

In a 2007 presentation to the utility industry, ScottMadden Management Consultants (2007) discussed cross-sector and cross-industry challenges to build and maintain a competent workforce. One company that participated in that study identified competing employment opportunities as one of the top four HR challenges facing coal operations in the western United States (Marshall, 2007).

In fact, there are significant opportunities for worker migration into the coal mining sector. The construction and automotive labor pools may be prime candidates for such workforce transfer, for three reasons. First, current economic cycles indicate that there may be a significant number of displaced workers in those industries. Second, they show very different age distributions than the coal mining sector, as depicted in Figures 7.5 and 7.6. Third, many of the skills in these sectors are applicable and transferable to the coal mining industry.

2.6 Other Considerations

Although much available information has been focused on skilled and general labor pools, similar recruitment, training, and retention considerations apply to managerial, professional, tradesperson, and technician positions in the coal industry sector. Some management positions may not require a specialized mining or coal industry background; however, the professional category is founded on technical and scientific training. A 2004 study by Downing Teal reported that 52 percent of mining professionals were over 50 years of age and 28 percent were over 55 (McCarter, 2007). Assuming retirement of the current cadre at age 62 and the projected growth of the mining industry, an additional 400 new mining engineering graduates are necessary each year, just to maintain current levels in all mining sectors. In 2007, there were 123 B.S. graduates in mining engineering in the nation (McCarter, 2007). Thus, to meet the needs across the entire mining sector requires more than tripling the current output. In addition, using MSHA data from 2002, 15 percent of the active mining engineers are employed in coal mining. Accepting this assumption, 60 new mining engineering graduates must enter the coal sector annually to replace retiring engineers and account for new growth.
The above studies also emphasized that institutions providing educational opportunities in the broad mineral disciplines will not be able to expand without significant industry investment.

In the tradesperson, technician, and managerial categories, one critical consideration for recruiting and retaining employees is the ability of experienced staff to move easily to other mining sectors or to other industries in the geographical area around the mine. This migration to and from the coal mining sector can work in both directions; such “transfer” workforce may be a significant source for meeting future workforce demands.

The characteristics of the individuals who will be available to enter the workforce are also important to recruitment. As the Baby Boom Generation reaches retirement, most new hires will come from Generation X, Generation Y, and the Millennium Generation (see Box 7.1). These generations differ greatly in salient characteristics and expectations from the baby boomers. These three groups are generally very technology oriented or even technology dependent, do not have a view of “lifetime employment” or long-term loyalty to employers, and are looking for personal development and self-expression as much as career development (ScottMadden Management Consultants, 2007). On the positive side, this pool contains potential employees who are risk-taking, adaptable, and motivated self-starters and team players (Allen, 2003).

For many years, the upcoming onslaught of baby boomer retirement has loomed on the horizon and many corporate human resource (HR) professionals and departments have advocated within the corporate echelon the need to plan and prepare a long-range human resource action effort. However, fiscal realities and policies have often prevented companies, including many within the coal sector, from implementing succession planning that would include hiring replacements before the job is vacated, developing existing staff resources through training, and providing adequate continuous education, upskilling, and cross-training opportunities.
3. MAJOR FACTORS IN WORKFORCE DEVELOPMENT

3.1 Recruitment

Because individual coal mining companies do their own recruitment, there is not a coordinated, industry-wide effort to collectively recruit employees. Some companies have initiated outreach programs to improve the reputation of the industry, including exposure to students at primary schools. Such efforts, although long term in focus, may result in the development of educational programs and resources, funded by private and public partnerships, to meet the workforce needs of the coal sector.

In its report, “Staffing the Supercycle,” the Mineral Council of Australia addresses similar recruitment challenges by recommending that “attraction and remuneration” systems be designed that give economic advantages to mining concerns (Lowry et al., 2006). In addition, the Council recommended a concerted effort to identify and target alternative labor reservoirs, such as people residing in areas outside traditional mining communities, and women. Similar strategies are also proposed in the Canadian mining workforce study, Prospecting the Future (MITAC, 2005). One additional recommendation for improving the workforce supply is recruiting in minority communities that have not been traditionally employed in the sector.

History may provide some insight to the problem of recruiting a coal mine workforce. In the 1970s, during the rapid expansion of the industry when more employees needed to be recruited, the nation experienced a tremendous growth in training and/or retraining programs, funded by government and industry, aimed at new and displaced workers. Because of very competitive salary/wage packages, a significant number of new entrants were attracted to the coal industry. The training and educational infrastructure that was in place during the last major expansion of the coal industry in the early and mid 1970s was dismantled during the industry decline of the 1980s and 1990s.

3.2 Education and Training Issues

A significant issue in developing a sufficient professional, technical, and managerial workforce is the availability of education programs at the degree level in minerals-related disciplines. Because managerial skills are more generic and those programs are available at a number of institutions around the country, no particular efforts were made to identify their availability. For professionals and technicians, however, a shortage of available programs is accepted and well reported.

There are a number professional disciplines related to the coal mining cycle for which specialized education is necessary. Because the Society for Mining, Metallurgy and Exploration, Inc. (SME) systematically collects data on mining schools, one can use mining engineering as a representative case for these disciplines. However, based on evidence and discussions with professionals in a number of related fields, similar trends are experienced for professional education in coal processing, geology and geologic engineering, environmental sciences, and reclamation-related disciplines.

The number of mining engineering programs in the United States has fallen from 25 in the 1980s to fewer than 15 today. Over that period, the number of graduates has fallen from a high of 700 in the early 1980s to 123 in 2007 (McCarter, 2007). SME data show some progress; for instance, there were only 87 mining engineering graduates in 2004.
Currently, there are approximately 821 students enrolled in mining engineering programs across the United States. It is projected that there will be approximately 200 graduates in mining engineering in the class of 2012.

Programs in geology, geologic engineering, and related fields have also seen decreases in numbers. Mining technology programs, once a mainstay of community colleges and vocational schools in coal mining areas, have in essence disappeared. A few programs in mining technology have been started, or at least contemplated, in recent years, but there is a shortage of data on the number of students enrolled or graduating from those programs.

Data on educational levels of the coal mining workforce (B. Watzman, NMA, pers. comm., September 7, 2007), updated with recent statistics from the U.S. Census, demonstrate that most employees currently are limited to a high school diploma (Figure 7.7). However, with increased automation and mechanization, some specialized training is needed. Traditionally, this training has been provided by mining operators and equipment manufacturers, or through vocational programs; however, many of these programs have been discontinued. On-the-job training impacts productivity, can add costs to production, and may create safety hazards as unskilled personnel learn to use new equipment or conduct new operations. Increased focus on environmental and health and safety needs and productivity goals will require additional training across the spectrum of the coal mining workforce.

In addition to more specialized training, the workforce will require further formal education to work safely and productively with new technologies that are designed to meet increased concern for the environment and health and safety. For example, many industries and companies encourage technical personnel on a managerial track to obtain advanced business degrees (such as an MBA) and, to a limited extent, their technical/engineering professionals to obtain advanced specialized degrees in their area of discipline (such as an M.S.). Although some coal companies participate in such educational opportunities, as an industry, the sector needs to further support the professional development and continuing education of their managers and engineers. These educational opportunities should complement the educational needs and demands for improved and expanded skills for the remaining members of the workforce, who overwhelmingly are limited to high school diplomas.

Although some jobs in the coal mining sector may remain relatively unchanged over the next 25 years, most will become much more complex and will involve new skills for workers at that time. Incoming workers will bring enhanced technical capabilities that will make new training options more desirable than traditional methods. One key issue as coal mining techniques and processes change will be the integration of higher education with training and vocational education and even, in some cases, primary and secondary education.
Further, higher education institutions that lack a traditional coal mining focus may need to become more engaged in this specialty and supply additional professionals to the industry. Such institutions may also play a vital role in supplying additional workforce members from non-traditional sources. For example, mining-related schools may partner with institutions that serve minority communities in order to encourage and recruit students interested in entering the coal mining sector.

Additional training resources will also be needed within the mining industry to address the new skill sets that will be necessary to achieve increased coal production. Some companies that participated in the development of this report have created career development programs within their organizations and they envision an ongoing need for these programs (Rusnak, 2007; Boam, 2007). The increasing universality of Internet and distance learning approaches and resources can provide both coal mining companies located in remote areas and diverse groups of potential coal mining workers with opportunities for training and education that were not available in past decades.

### 3.3 Competitive Challenges

As indicated above, many of the workers required by the coal mining sector will have the opportunity to be employed in other industries in the same geographic area. Many of the skill sets of tradespersons and managerial, administrative, and technical staff are applicable in the construction, automotive services, electrical utility, and manufacturing sectors. These industries may enjoy the competitive advantage of a better reputation, in terms of safety and environmental performance, better working conditions, and perhaps more competitive salary and benefit packages, than the ones enjoyed by personnel in the coal mining industry. Many highly skilled or professional employees may find the rural communities where coal is often mined less desirable than the areas where they can obtain jobs in other industries. For example, mining engineers can often find employment with aggregate operations located near most major metropolitan areas in the country. An urban location may be more desirable for multiple-career families rather than remote areas that offer limited career opportunities.

Although national and local salary averages for jobs in the coal mining sector compare favorably with the average for all sectors (Table 7.1), in some states, the differences are much smaller, and the number of available positions and perceived working conditions may dictate which industry an individual chooses for employment.

### 3.4 Best Practices

A number of mining companies have responded to workforce challenges by changing corporate structure, HR functions, and their overall approach to employment. These programs address jobs across the spectrum, from general labor to professional and managerial positions. With the majority of the workforce being in skilled or tradesperson positions, these jobs have been a primary focus. Many companies have addressed these workforce issues, but the practices of some companies appear to be benchmarks and examples of best practice.

Some companies who participated in the kick-off meetings of this study reported special steps to improve recruitment. For example, BHP Billiton stresses the development of in-house resources and a detailed HR plan that includes new recruiting efforts. BHP Billiton, like many other large corporations, is considering sponsoring external HR and recruiting organizations, and is taking advantage of Internet-based recruiting, such as using sites like Monster.com as a means of reaching out to nontraditional communities (Boam, 2007).
Other companies are also looking into innovative ways to recruit, retain, and develop employees, with significant financial rewards and aiming at building loyalty, ownership, and pride. One recent example is shown in Box 7.2.

The approaches being used or contemplated by other industries, such as the strategies identified for use by energy and utilities industries (ScottMadden Management Consultants, 2007), are also potentially adoptable by the coal mining sector. Ideas that are potentially transferable include: outreach in high schools, cooperative agreements with technical schools, development of internship and cooperative education programs, affiliation with university career development offices, and dedicated marketing of the industry and jobs within the industry. The NMA has recommended coordinating these efforts by establishing a partnership among industry, educational institutions, training providers, and government (B. Watzman, NMA, pers. comm., September 7, 2007). Some partnerships have already been established between industry and labor (J. Main, UMWA, retired, pers. comm., 2008), focusing on recruitment, training, and retention. This partnership is in the process of examining different recruiting models and strategies to address competition for the same workers by other industries facing the same employment needs.

One company that contributed to this particular study, Rio Tinto Energy America, has focused energy and resources on the issue of both work life and personal life needs of the work force. In this case, and with the recent boom in coal bed methane exploitation in the Powder River Basin area of Wyoming, housing has become very scarce. This company has used their corporate leverage to obtain housing options for their workforce and is considering other ways to meet this basic need of their employees. Additionally, the same company reported their effort towards providing necessary health care resources to employees in such relatively remote locations. In the area of work life, the same group noted that they have provided new apprenticeship and other programs that enable improved career development (Marshall, 2007).

BHP Billiton also reported their implemented comprehensive and innovative corporate policies for workforce development in the coal mining sector. Such programs provide remedial training, apprenticeships, and scholarship programs for vocational-technical schools, among other educational benefits, to build a cadre of skilled tradespersons. The company also noted the employee involvement in career development planning. Finally, the same group reported company-wide development of strategies for succession

BOX 7.2 ALPHA NATURAL RESOURCES INCENTIVES

Alpha Natural Resources recently instituted unprecedented compensation and benefits for its employees as a means of “expressing (its) appreciation...and...introducing incentives to attract and retain the next generation of miners.” Employees were given shares of company stock, relieved of the need to contribute to benefits such as insurance, provided with new bonuses and cash payments, and provided with an “energy relief/fuel assistance” program to help offset the cost of commuting to remote mining sites. “We see this as a significant day—maybe the most significant—in our company’s history,” said Mike Quillen, Alpha’s chairman and CEO. “Alpha’s shareholders have benefited from their dedication and hard work, and it’s time we publicly acknowledge their efforts (Coal Age, 2008).”
planning and other corporate initiatives to ensure that current and future workforce needs are met (Boam, 2007).

There are a number of innovative programs in other companies that can be considered as best practices. Examples are shown in Boxes 7.3 and 7.4. It is unclear, however, whether such programs are discussed among HR professionals in the coal sector, or if companies consider such innovative programs as matters of competitive advantage, thus keeping the details of these programs within the company.

BOX 7.3 PEABODY ENERGY TRAINING CENTERS

The efforts of Peabody Energy to prepare for the retirement of many of its experienced miners by developing training centers for new employees were discussed in a recent article (Laws, 2006). These centers are located near small mines, and four such centers already exist in West Virginia, Kentucky, Indiana, and Wyoming. New hires undergo a nine-week training class that includes work in simulators as well as hands-on experience in mines. According to a company spokesman, "We teach these young people the right way to do the work. When they hit the mine, they're ready to step into the workforce. It's working out very well" (Laws, 2006).

Peabody was concerned that recent mining incidents might limit the number of people interested in mining careers, but the company reports success in attracting recruits to their centers, even after these incidents. This success can be attributed in part to the company's commitment to health and safety.

BOX 7.4 CONSOL ENERGY TRAINING CENTERS

Consol Energy has developed a network of training centers, with more under development, to enhance their ability to operate efficiently and productively. One focus is on providing skills to both new and existing employees related to their jobs, but the major thrust of the program is Consol's "Absolute Zero" safety effort. "All training has been reviewed to ensure all employees understand our goals and how to achieve them," said Mark Hrutkay, Consol's employee development manager. "The new Absolute Zero approach has also had a significant and positive impact on recruiting new employees into Consol. It is easy to articulate and places Consol in a great position to attract top talent."

Consol recently started the "Consol Leadership School" to augment staff retention. The program, which consists of 12 modules to be completed over a four- to six-year period, prepares staff for taking on a management role at any of Consol's 17 mining complexes located in six states. Over 100 employees are currently enrolled.

The Consol training centers are located in Utah, West Virginia, Virginia, and southwestern Pennsylvania. The Utah center, near the Emery mine in Price, also involves the College of Eastern Utah. In an innovative development, Consol is considering an underground training facility at its Robinson Run mine in West Virginia (International Longwall News, 2008).
4. DATA COLLECTION AND WORKFORCE PROJECTIONS

4.1 Current Census of the Coal Mining Workforce

One significant challenge in determining how many employees are engaged in the coal mining sector is the different definitions used by the various agencies that collect such data. This issue was highlighted earlier in Section 2.1, where the discrepancy among BLS, MSHA/NIOSH, and EIA was discussed. Because many of the tools that allow for analysis of future workforce needs in the coal sector are based on EIA 2005 production and productivity estimations, the EIA manpower data have been used in the analysis to calculate and project future coal workforce needs.

Predicting changes in the coal mining workforce over the next decades requires a number of assumptions and considerations, as shown below:

- 2005 Address/Employment MSHA Part 50 data were used (instead of 2006 data) because the EIA Coal Productivity Forecasts are for 2005 base data.

- Differences in EIA and MSHA coal production data are due to differences in data collection processes. The production values reported by EIA were used for workforce calculations.

- Grouping age data into three different regions (Appalachian, Interior, and Western) makes it easier to predict which locations will be impacted by workforce shortages. States such as Kentucky and Montana are hard to differentiate between supply regions (see definitions in Table 7.2).

- Complete and accurate age data are not readily available and typically are only reported when employees are involved in accidents.

- Data obtained from the Census Bureau do not always correlate well to data obtained from other sources.

- Coal miners’ anticipated retirement age was assumed to be 62 years old.

- As a result of the assumed retirement age, the calculations for retirement replacements assumed that two out of five miners in the 60–65 age bracket would remain in that age bracket and the other three are assumed to retire.

- The retention rate for new hires is assumed to be 70 percent. Based on some reported company data, this rate may be a worst-case assumption.

- For the 10-year shifts in time, 2010 to 2020 and 2020 to 2030, seven of 12 new hires are assumed to be in the 18–25 age range and the other five of 12 are assumed to be in the 25–30 range.

Based on those assumptions, productivity estimates from the EIA were used to calculate the necessary number of miners in each region based on the projections of coal production in the EIA base case scenario. “Man-hours” represents the hours of production workers and do not include managerial and professional categories. Tables 7.3–7.6 illustrate the calculations.
4.2 Needs for Labor, and Skilled and Professional Employees

Based on the current workforce census, projected levels of productivity and coal production, as presented in the Tables 7.3–7.6, and the projected retirement and retention rates discussed earlier, Tables 7.7–7.10 show the projected workforce levels between now and 2030. In reviewing these tables it should be noted:

• “Number of miners” is taken from U.S. Census data from coal-producing states only. It is reasonable to assume that the Census data are primarily based on responses from production workers.

### TABLE 7.3 Production per man-hour (tons/man-hour).

<table>
<thead>
<tr>
<th>REGION</th>
<th>2005</th>
<th>2010</th>
<th>2020</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appalachian</td>
<td>3.75</td>
<td>3.57</td>
<td>3.63</td>
<td>3.62</td>
</tr>
<tr>
<td>Interior</td>
<td>5.00</td>
<td>5.06</td>
<td>5.03</td>
<td>4.94</td>
</tr>
<tr>
<td>Western</td>
<td>12.23</td>
<td>12.44</td>
<td>14.77</td>
<td>12.67</td>
</tr>
</tbody>
</table>


### TABLE 7.4 Regional coal production estimations (million of short tons).

<table>
<thead>
<tr>
<th>REGION</th>
<th>2005</th>
<th>2010</th>
<th>2020</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appalachian</td>
<td>397</td>
<td>357</td>
<td>339</td>
<td>346</td>
</tr>
<tr>
<td>Interior</td>
<td>149</td>
<td>156</td>
<td>206</td>
<td>251</td>
</tr>
<tr>
<td>Western</td>
<td>585</td>
<td>626</td>
<td>744</td>
<td>998</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1131</td>
<td>1139</td>
<td>1289</td>
<td>1595</td>
</tr>
</tbody>
</table>


### TABLE 7.5 Required man-hours to achieve production.

<table>
<thead>
<tr>
<th>REGION</th>
<th>2005</th>
<th>2010</th>
<th>2020</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appalachian</td>
<td>106,049,937</td>
<td>99,870,758</td>
<td>93,280,337</td>
<td>95,383,488</td>
</tr>
<tr>
<td>Interior</td>
<td>29,849,940</td>
<td>30,958,459</td>
<td>40,909,599</td>
<td>50,852,524</td>
</tr>
<tr>
<td>Western</td>
<td>47,835,957</td>
<td>50,305,248</td>
<td>50,412,187</td>
<td>78,738,527</td>
</tr>
<tr>
<td>TOTAL</td>
<td>183,734,834</td>
<td>181,134,465</td>
<td>184,602,124</td>
<td>224,974,538</td>
</tr>
</tbody>
</table>

SOURCE: http://www.msha.gov/STATS/PART50/p50y2k/p50y2k.HTM

### TABLE 7.6 Number of coal employees required based on man-hours.

<table>
<thead>
<tr>
<th>REGION</th>
<th>2005</th>
<th>2010</th>
<th>2020</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appalachian</td>
<td>53,024</td>
<td>49,935</td>
<td>46,640</td>
<td>47,692</td>
</tr>
<tr>
<td>Interior</td>
<td>14,925</td>
<td>15,479</td>
<td>20,455</td>
<td>25,426</td>
</tr>
<tr>
<td>Western</td>
<td>23,918</td>
<td>25,153</td>
<td>25,206</td>
<td>39,369</td>
</tr>
<tr>
<td>TOTAL</td>
<td>91,867</td>
<td>90,567</td>
<td>92,301</td>
<td>112,487</td>
</tr>
</tbody>
</table>

SOURCE: Calculated from production per man-hour data, assuming a typical work week of 40 hours and 50 work weeks per year.
• "Percent change" in Tables 7.7–7.10 is from the previous time period.

• "Required new miners" is calculated based on assumed retirements and changes in productivity and total production.

• "Required trainees" assumes a 70 percent retention rate; that is, 70 percent of persons trained actually become new miners.

The totals in Tables 7.7–7.10 reflect a spectrum of job functions. As mentioned earlier, the proportions of personnel in each of these employment categories can vary widely, based on the size of the

<table>
<thead>
<tr>
<th>YEAR</th>
<th>NUMBER OF MINERS</th>
<th>CHANGE</th>
<th>REQUIRED NEW MINERS</th>
<th>REQUIRED TRAINEES</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>52,024</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>2010</td>
<td>49,935</td>
<td>-5.8%</td>
<td>8,561</td>
<td>12,230</td>
</tr>
<tr>
<td>2020</td>
<td>46,640</td>
<td>-6.6%</td>
<td>14,415</td>
<td>20,593</td>
</tr>
<tr>
<td>2030</td>
<td>47,692</td>
<td>2.3%</td>
<td>19,751</td>
<td>28,216</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>YEAR</th>
<th>NUMBER OF MINERS</th>
<th>CHANGE</th>
<th>REQUIRED NEW MINERS</th>
<th>REQUIRED TRAINEES</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>14,925</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>2010</td>
<td>15,479</td>
<td>3.7%</td>
<td>4,221</td>
<td>6,031</td>
</tr>
<tr>
<td>2020</td>
<td>20,455</td>
<td>32.1%</td>
<td>12,394</td>
<td>17,706</td>
</tr>
<tr>
<td>2030</td>
<td>25,426</td>
<td>24.3%</td>
<td>11,146</td>
<td>15,923</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>YEAR</th>
<th>NUMBER OF MINERS</th>
<th>CHANGE</th>
<th>REQUIRED NEW MINERS</th>
<th>REQUIRED TRAINEES</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>23,918</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>2010</td>
<td>25,153</td>
<td>5.2%</td>
<td>4,764</td>
<td>6,805</td>
</tr>
<tr>
<td>2020</td>
<td>25,206</td>
<td>0.2%</td>
<td>3,684</td>
<td>5,262</td>
</tr>
<tr>
<td>2030</td>
<td>39,369</td>
<td>56.2%</td>
<td>14,075</td>
<td>20,107</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>YEAR</th>
<th>NUMBER OF MINERS</th>
<th>CHANGE</th>
<th>REQUIRED NEW MINERS</th>
<th>REQUIRED TRAINEES</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>91,867</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>2010</td>
<td>90,567</td>
<td>-1.4%</td>
<td>17,546</td>
<td>25,066</td>
</tr>
<tr>
<td>2020</td>
<td>92,301</td>
<td>1.9%</td>
<td>30,493</td>
<td>43,562</td>
</tr>
<tr>
<td>2030</td>
<td>112,487</td>
<td>17.9%</td>
<td>44,972</td>
<td>64,246</td>
</tr>
</tbody>
</table>

**TABLE 7.7** Workforce projections, Appalachian region.

**TABLE 7.8** Workforce projections, Interior region.

**TABLE 7.9** Workforce projections, Western region.

**TABLE 7.10** Workforce projections, U.S. total.

**TABLE 7.11** Workforce projections, U.S. total.
company, the type of mining operation (surface or underground, large-scale or small-scale), and the overall corporate structure. Workforce studies conducted in Canada and Australia also demonstrate the central role of skilled or semiskilled employees in the coal mining sectors in those countries. Of the anticipated increase of 15,785 jobs in the Australian coal mining industry, 4.5 percent of the growth is projected to be in general labor, 49.9 percent in skilled workers, 26 percent in tradespersons, 2.6 percent in technical employees, 7.8 percent in professional employees, and 9.2 percent in management and administration (Lowry et al., 2006).

There are also significant differences in the retirement age and retention rate among the different job categories. Unfortunately, no definitive data were available to this study that could allow quantification of these differences. However, anecdotal evidence indicates what is intuitively obvious: jobs that have greater physical demands have higher turnover rates and lower retirement ages. Data for all industries seem to support these observations (BLS, 2008).

In summary, the data and workforce projections indicate that, based on projected production increases alone, an additional 21,000 persons will be needed for the coal mining workforce by 2030. Because another 24,000 new jobs will be needed to fill open positions due to retirement, a total of 45,000 new workers will be needed to fill projected workforce needs. These figures are supported by recent industry estimates (Quillen, 2008) that have projected a need for 50,000 new workers in the next 15–20 years. Assuming conservative retention rates, the data indicate that 64,000 new workers will need to be recruited and trained.

5. ISSUES AND CHALLENGES

5.1 Effects of Workforce Replacement on Safety, Productivity, and Profitability

The addition of large numbers of new employees within the coal mining sector over the next two decades will inevitably influence productivity and safety. Less-experienced employees often are associated with more accidents and higher incident rates than their more experienced colleagues (Groves et al., 2007). One company that participated in this study compared the workers at a coal mine to a sports team, and indicated that when members of the team change, the effectiveness, efficiency, and safety of the team is impacted (McAtee, 2007). This company, representing small operators, reported that among the most significant safety challenges for the coal industry are “the ergonomic challenges facing an aging work force in thin coal seams, the large influx of new employees into the coal industry and the associated training issues, employee turnover and the potential safety problems resulting from unstable work groups, and the lack of experienced supervisors and the potential risks associated with the quality of front line leadership skills.”

In recent years, the aging workforce in the coal sector has been experiencing more injuries as a result of the challenges inherent in performing physical tasks at more advanced ages. Chronic injuries and
illnesses are also more common in older workforce populations, and require additional time for recovery (Moore et al., 2008). Studies have also noted that older workers are at a higher risk for serious or fatal incidents in part because of exposure to more difficult jobs with greater inherent risks (Groves et al., 2007).

Safety issues will require enhanced training both for new employees to prevent accidents, and for experienced employees to build increased awareness of chronic injury and illness, and increased risk of fatal accidents. Additionally, programs such as the ones reported by a company in this current study that include pre-employment safety testing, may also be key components of new training to address safety issues (Boam, 2007). Another major coal operator in this study noted the importance of safety, culture, and the well-publicized company motto, “Absolute Zero” in creating a corporate culture that influences the attitude and actions of the workforce (Holt, 2007).

Enhanced education and training may also be the answer for addressing productivity issues in the growing coal mining sector workforce. The use of innovative advanced simulation, virtual reality training, and other vendor-provided training may allow new employees to become familiar with equipment prior to being exposed to the production environment. Companies will need to adopt extensive on-the-job training, apprenticeship programs, mentoring, and other similar approaches in order to help mitigate losses in productivity that may be associated with new workers.

In summary, workforce replacement has inevitable impacts on safety and productivity, and, as a result, profitability. Addressing training and education challenges, developing a corporate culture that enhances retention, and drawing upon experienced workers to help mentor new employees in processes and procedures will have a great influence on how much workforce turnover will impact safety, productivity, and profitability.

5.2 New Workforce Pool

As discussed earlier in this chapter, the pool of available employees will come primarily from Generation X, Generation Y, and the Millennium Generation. Given the different characteristics of these generations, coal sector employers will have to revise HR policies to take advantage of the skills, abilities, and attitudes that these individuals bring to the workforce, and will have to adapt to their needs and attitudes. For example, there will be a need for more training, job shadowing, mentoring, and career and personal development opportunities to allow and encourage employees to change jobs within the company, rather than to move out to another company or industry. Some companies are already responding to these needs. For example, one company reported that they have initiated a number of strategies to address these needs, including apprenticeship programs, scholarships, hiring bonuses, relocation assistance, detailed succession planning, and career path coaching (Boam, 2007).

Among the pool of potential workers, issues such as the use and abuse of alcohol and other drugs may be prevalent. A recent report indicates the highest levels of alcohol and drug abuse occur in the coal mining and construction industries. The study also indicates that many reports of abuse of drugs such as OxyContin come from “economically depressed, rural areas housing labor-intensive industries such as logging and coal mining” (Laws, 2006).

There is also a pool of potential workers in the veterans returning from ongoing military actions around the world. Many of these individuals may be less adverse to the perceived risk and problems in working conditions associated with coal
mining. Additionally, they have been trained in various skills that may be easily applicable in the coal sector.

5.3 Location of New Workforce

The change in the location of production forecast between now and 2030 will see a shift of coal mining employment opportunities from the Appalachian region to the west, particularly to the Powder River Basin and the Interior coal producing region. In the near term, between now and 2020, workforce needs in the Appalachian region will decrease by 5.8 percent by 2010 and by 6.6 percent by 2020 (Table 7.7). However, the projections in Table 7.7 indicate the need for coal-mining workers in the Appalachian region will increase by just over two percent by 2030.

The increase in need for miners follows a different trend in the Interior region. In 2010, it is projected that there will be a 3.7 percent increase over 2005 levels; a 32.1 percent increase by 2020; and a 24.3 percent increase by 2030 (Table 7.8). The data indicate another trend for the Western region: a 5.2 percent increase through 2010; an additional 0.2 percent increase by 2020; and an impressive 56.2 percent increase over the decade between 2020 and 2030, when production in the region is projected to skyrocket (Table 7.9).

Based on projections for the total coal-sector workforce and accounting for retirements and other losses, by 2030 there will be a need for 19,751 new coal miners in the Appalachian region; 11,146 in the Interior region; and 14,075 in the Western region (Tables 7.7–7.10). The total projected need for new coal-mining workforce is 44,972 (Table 7.10). Assuming an attrition rate of 70 percent, the projections indicate that by 2030, approximately 28,216 new industry recruits are needed for the Appalachian region, 15,923 for the Interior region, 20,107 for the Western region, and 64,246 total for the United States (Tables 7.7–7.10).

These numbers show that it will be necessary for some of the new coal workforce participants to transfer from other industrial sectors. Age distributions in the construction and automotive services industries in coal mining states (Figures 7.5 and 7.6) indicate that individuals with similar skill sets are available for recruitment into the coal sector. In addition, there are employees in other mining sectors, such as aggregates, metals, and other nonmetal production, that may be enticed into the coal industry.

It is unclear what incentives may be necessary to encourage these transfers to occur. In addition, apprenticeship programs and other training provided by the coal mining sector may provoke transfers out of the sector to other jobs that may be more appealing for various reasons. This negative job flow is particularly true among tradespersons and technicians. Because many of the coal producing areas in the West are not in close proximity to population centers, this shift presents a challenge. In addition, cultural norms within rural communities tend to limit the mobility of workers from one area of the country to others.

Wage and salary differences between coal mining and other industry sectors may entice entry into the industry from a variety of other fields. Those salary differences are not as pronounced between coal mining and other types of mining, and many skill sets in the different mining sectors are very specialized and may differ widely, providing a disincentive to transfers between those sectors.

Additionally, as the U.S. population increasingly concentrates in metropolitan areas, the availability of a workforce in proximity to coal mining will be limited. To encourage workers to relocate to mining areas, recruiting efforts may be required at
locations a great distance from coal mining operations. Drawing the needed workers will require the addition of community services, such as housing, medical facilities, schools, retail, and other service resources in relatively rural coal mining areas.

5.4 Impact of the Global Labor Marketplace

Australia and Canada studies (MITAC, 2005; Lowry et al., 2006) show that international mining interests, including coal, will face similar labor shortages and demographic and recruiting issues as the United States. They indicate the need for an additional 70,000 mining employees in each country by 2015, with additional increases likely after that. “There is a chronic shortage of skilled people, and wages have skyrocketed,” reported a commodity strategist in Canada (Delaney and Bailey, 2008). In response, some international mining houses are taking aggressive action to meet their manpower requirements, especially in the area of recruiting scientific and technical personnel, by focusing directly on the global marketplace and offering high salaries to mining engineers and geologists. According to Delaney and Bailey (2008), salaries are up 44 percent in three years at major mining houses such as BHP Billiton Ltd. (Australia) and Teck Cominco Ltd. (Canada), approaching or even topping the average salary for MBAs entering the United States workforce.

Vale and BHP Billiton are aggressively recruiting professionals and engineers in the global marketplace. BHP Billiton has run English-language ads in Brazil encouraging professionals to “think about calling Australia home.” Vale has reported recruitment ads in four overseas markets (Australia, Canada, the United Kingdom, and the United States) and plans to recruit one-fifth of its new professional staff from outside Brazil (Wheatley 2008).

For now, international recruitment applies primarily to the engineering and scientific professionals of the mining workforce. These trends may have some impact on international movement and recruiting of tradespersons. There is no evidence as yet of such movement at the unskilled workers’ level.

Global marketplace issues have an impact on U.S. coal interests in two ways. First, global recruitment of U.S. graduates interested in pursuing coal industry careers will further shrink the already limited pool available to the domestic coal industry. Second, given the aggressive global recruitment efforts of the major mining houses, it will be increasing difficult for U.S. coal companies to compete and recruit technical talent from overseas.

5.5 Training and Education Needs

Given the wide range of jobs within the coal mining sector, there is a great diversity of educational and training resources available to support those functions and skills. As previously stated, maintenance of the current number of mining engineers in the United States across all commodities will require as many as 400 graduates per year, which is about three times the number being produced by U.S. universities (McCarter, 2007). This projection does not include those engineers and scientists in other disciplines that will be needed to address increased production, changing technology, or differing regulatory requirements.
The number of skilled employees will increase more than any other classification of jobs within the coal sector. Although some of the training needed for those employees may be provided by the companies, other training may come from union programs, private training vendors, or government agencies. Changes in requirements, for example, those due to changes in health and safety laws, may require training of a large population of coal mining workers. On-the-job training and apprenticeship programs for tradespersons are also key parts of the training infrastructure that will need to be enhanced to meet the increased workforce’s needs.

Although some programs in mining technology or vocational mining exist at a limited number of schools, the extent and availability of those programs does not address the need for additional workforce with those skills. Box 7.5 discusses one example of a program that has been created in Kentucky.

Labor organizations have also developed training programs to help ensure that new entries into the coal sector are thoroughly prepared for a career in coal. The United Mine Workers of America (UMWA) has established centers in West Virginia and Pennsylvania (see Box 7.6) that provide new

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**BOX 7.5 THE KENTUCKY COAL ACADEMY**

One recently created mining vocational program is the Kentucky Coal Academy, which was created by the Kentucky General Assembly in 2005 as a part of the Kentucky Community and Technical College System (KCTCS) (see http://coalacademy.kctcs.edu/index.cfm). The academy is a statewide training program intended to meet the workforce needs of the coal industry. According to the Academy’s website:

“The first program goal is to provide short-term training for new miners to satisfy the industry need for skilled workers. A second is the creation of a career path in mining to sustain the viability of the coal mining career and support the coal industry. The Kentucky Coal Academy is comprised of four of KCTCS’ community and technical colleges located in the eastern and western Kentucky coalfields. The mission of the Kentucky Coal Academy is:

- **To educate and train** the coal workforce of the future.
- **To create and sustain** jobs in the coal industry.
- **To provide career pathways** for miners from high schools and area technology centers, which will include certificates, associates degrees and baccalaureate degrees.

A key element of the mission of the KCA will extend coal education at the secondary level through the Kentucky Junior Coal Academy. The extended early educational opportunity will provide three career paths for students interested in mining. These paths include:

- Employment in the industry immediately following high school graduation.
- Pursuit of a two-year degree as a pre-engineering technician or an Associate’s degree in Mining through KCTCS.
- Pre-Engineering (toward a 4+ year degree in Mining Engineering)”
miners with nine weeks of training related to various aspects of coal mining and health and safety (J. Main, UMWA, retired, pers. comm., 2008).

Specialized education and training will be needed for the workforce that transfers from other industrial sectors, from other geographic areas, and possibly from other countries. In some cases, this training may be very basic, such as an overview of the coal mining industry or coal geology; job specific, such as how to operate a particular piece of equipment; or essential but not job related, such as teaching English to non-native speakers.

5.6 Corporate Culture and Commitment

The committee for this study discussed and exchanged ideas with representatives of small, medium, and large coal mining companies, government agencies, and others involved in the coal mining sector. Many of the presentations and materials obtained from the mining companies addressed corporate philosophies and culture, particularly relating to safety and workforce development. The issues discussed by company representatives clearly indicated that a number of companies are in the forefront of HR practices and can serve as examples of best practices in this area.

**BOX 7.6 THE MINING TECHNOLOGY AND TRAINING CENTER, INC. (MTTC), UNITED MINE WORKERS OF AMERICA (UMWA)**

According to the UMWA website (http://www.umwa.org/index.php?q=content/career-centers):

“As the nation’s dependency on coal increases and the existing workforce ages, the labor demand for coal miners is increasing. It is the mission of the UMWA Career Centers to offer training programs for new miners, as well as individuals who have been dislocated from the mines.”

The UMWA MTTC, Inc., offers a nine-week training program for new entrants into the mining industry, delivered at two locations: Beckley, West Virginia, and Ruff Creek, Pennsylvania. The training is designed to build a solid foundation under individuals that seek a mining career (Joe Main, UMWA, retired, pers. comm., 2008) and exceeds the minimum 40-hour training requirement. The miners receive in-depth training on mine ventilation, mining systems, and a variety of other mining subjects. According to the website, http://www.umwacc.com/new_page_16.htm: “At the successful completion of the course, students will receive a certificate from either Penn State University (for students attending the Ruff Creek, PA Campus) or the Community and Technical College at West Virginia University Institute of Technology (for students attending the Beckley, WV Campus). Additionally, students will receive state certification (after successfully completing all work and passing all necessary tests) and a card from MSHA (Mine Safety and Health Administration). These certifications will give graduates the necessary criteria to enter the mining industry.”

The MTTC also provides mine foreman training and is in the process of developing other training programs (J. Main, UMWA, retired, pers. comm., 2008).
For example, some companies reported a retention rate for new employees of about 70 percent. Other companies, with more extensive programs focused on workforce and personal development, reported retention rates closer to 90 percent.

As mentioned earlier, many companies are responding to their current and future workforce needs. A variety of approaches are used, such as responding to housing and medical facility shortages, mentoring, career development programs, creating apprenticeships, and developing training centers, as in Boxes 7.3 and 7.4.

The career and personal development focus of some coal mining companies have resulted in lower turnover rates and greater job satisfaction. The commitment from the top echelons of a number of companies to a corporate culture that is dedicated to safety and to nurturing workforce development is also apparent. In addition, programs focused on work life and personal growth will be critical to developing long-term loyalty and to enhance the ability to recruit staff from locations distant from the coal mining operations.

5.7 Workforce Development Strategies

5.7.1 INDIVIDUAL COMPANIES

Companies should consider several strategies to address the additional workforce needed to sustain and increase coal production between now and 2030. Among these approaches are: emulating the industry leaders and benchmark practices; dealing with local issues, such as housing shortages; providing competitive salary and benefit packages; addressing perception issues by being open with local communities; developing mentoring and personal development opportunities; changing the corporate culture to build brand loyalty to the company; and developing resources for effective community recruiting, both from the community near the coal mine and from more remote communities with larger potential labor pools.

5.7.2 COAL INDUSTRY

Individual companies bear the largest burden for recruiting their own workforce. Because coal mining is extremely regionalized, the issues that impede acquisition of sufficient workers transcend company boundaries. There is a role for local, state, and national industry groups in building the future coal mining workforce. These organizations can contribute resources and encourage company efforts; build bridges between companies to allow for cooperative efforts and develop frameworks and venues for those efforts; support educational and training institutions; work with governments to build and facilitate public and private partnerships; support the funding of research, which provides additional support for higher education; support local vocational and technical schools, high schools, and other educational institutions by providing resources and expertise; and, perhaps most importantly, work to change the perception of the coal mining sector as an employer and good citizen.

5.7.3 GOVERNMENT

There is a role for government at all levels in supporting the growth of coal mining workforce as well. The types of actions that local and state governments can take may vary greatly from those which are appropriate for the federal government. At the local level, one key emphasis must be on providing the infrastructure necessary to support expanded communities and expanded coal mining workforces. For example, the need for housing, medical services, and education may be addressed in part through governmental action.

At the federal level, other actions are more appropriate. The types of actions in which federal
agencies may need to engage include: supporting comprehensive job training and employment development programs and partnerships; funding and supporting coal-related research; collecting and providing good data related to coal mining and related workforce issues; renewing support for local education and vocational training; supporting professional educational; supporting safety programs and training; and brokering industry cooperation.

In addition to these support actions, government agencies that deal with coal mining issues are faced with meeting their own workforce needs. The retirement crisis for the coal mining sector affects government agencies at all levels as well. At best, the replacement of the current experienced personnel is resulting in a major loss of experience and knowledge. In some agencies, retirements result in permanent loss of positions with more serious impacts related to fulfilling mandated missions. In many cases, the ability of government to respond to the challenges of workforce recruitment and development in the same ways that the coal mining industry can respond is limited by public policy, funding limitations, and government employment rules.

5.7.4 EDUCATIONAL AND TRAINING INSTITUTIONS

Traditionally, there have been clear divisions between educational institutions (particularly higher education institutions) and training providers who serve the coal mining sector. Occasionally, these barriers have been overcome through implementation of vocational training programs or mining technology programs that have relied on or been based within the educational community. One strategy that may be important for meeting workforce needs involves breaking down existing barriers between educational and training institutions. The audiences for education and training are often very different groups, and fall within the spectrum of job classifications. The opportunities for coordination and cooperation are numerous.

Within the higher education community, the survival and possible expansion of coal-mining-related educational programs, such as mining engineering programs, will require university administrators and leaders to be convinced of the need for such programs and their ability to remain sustainable as independent disciplines of education and research. The efforts of the industry and government must also include outreach to education.

As with all other participants in the coal mining sector, education and training institutions must develop succession plans for professors and instructors. The average mining faculty age has been increasing dramatically, and the supply of qualified replacements continues to be very low. The limited support in R&D funding available to the discipline, as noted in the NRC (2007a) study, Coal: Research and Development to Support National Energy Policy, has addressed this issue in more detail, including the difficulties in maintaining viable graduate programs at the Ph.D. level, the pipeline to the professorate. A recent study by SME projects the need for 21 additional mining engineering faculty members in the next two years alone (McCarter, 2007). Even if these new faculty are available, there will be need for research funding and other support to allow them to succeed within the requirements of the U.S. academic community.

To help the coal mining sector acquire a sufficient workforce to meet the need for increased production, some innovation will be required in educational and training institutions. Among the most critical improvements will be developing cooperative programs with government, industry, and other educational institutions to leverage resources and create a common approach. Additionally,
educational institutions and training providers will need to focus on distance learning and other similar approaches, such as the use of extension services, which have been common in agriculture for the past 150 years. With the variety of education and training resources that will be needed for the growing coal mining workforce, no one delivery mechanism, nor provider, will be appropriate in all cases. There will need to be a multitude of approaches and providers.

6. CONCLUSIONS

The coal mining sector will face significant challenges in meeting its needs for workers between now and 2030. Although many of these are similar to challenges that other industries and countries face with the retirement of the Baby Boom Generation, projected increases in U.S. coal production will also create additional demand for new workers. This significant workforce swing will impact all types of jobs in all areas of the coal mining sector, from coal producers to the coal community at large, including suppliers and service providers, educational and training institutions, and government agencies.

For many years, retirement of the baby boomers has loomed on the horizon and many corporate HR professionals and departments have long advocated planning and preparing long-range HR action efforts. However, fiscal realities and policies have often prevented companies, including many within the coal sector, from implementing succession planning that would include hiring replacements before the job is vacated, developing existing staff resources through training, and providing adequate continuous education, upskilling, and cross-training opportunities.

The workforce needs estimated and projected in this chapter, possibly more conservative than other industry estimates, have identified:

- A need for an additional 21,000 persons to the total coal mining workforce by 2030, based on increased production alone
- Additional 24,000 jobs due to retirements within the existing workforce, for a total of 45,000 new coal mining positions for the sector to the year 2030; this number conservatively supports coal industry estimates of 50,000 new positions
- Assuming conservative retention rates, to achieve 45,000 new coal mining employees, over 64,000 persons will need to be recruited and trained

These projections are limited to the general production workforce and do not include the serious deficit in managerial and professional positions that, according to most estimates, is expected to reach serious proportions in a few years.

This pool of new workers may come increasingly from areas distant to the coal mining activities, from women and minorities, from new generation workforce entrants, and from swing recruits from
other sectors, all of which will pose new challenges to the coal sector. The addition of large numbers of new employees will inevitably influence productivity and safety. Training issues, employee turnover, and potential safety problems resulting from unstable work groups, along with the lack of experienced supervisors and potential risks associated with the quality of front line leadership skills, pose concerns. This new workforce will also create additional and often specific educational and training needs and demands.

International recruiting, as a means of alleviating domestic problems, will be challenging, because other countries with substantial mining industries, such as Australia, Brazil, and Canada, are also projecting significant mining workforce shortfalls and are aggressively recruiting worldwide. The U.S. coal sector and community must consider the global situation, including competitive position and recruitment options, in developing manpower strategies.

The following recommendations are offered to address the issues of workforce recruitment, retention, and career-long development in the coal sector at large:

- **Create a new pool of workers for the coal mining industry.** Developing a pool of potential workers at all levels will require actions by coal producers, coal suppliers, state and federal governments, and educational and training institutions. Companies must develop, or reinforce, corporate philosophies and cultures that promote the development of employees, offering competitive salary and benefit packages and providing a caring and rewarding environment in order to enhance recruitment, retention, and development.

- **Integrate the impacts of a massive labor swing into human resources and operations strategies.** A major labor transition could have significant impacts on worker productivity, health, and safety performance, and even on social and cultural environments in the workplace and on mining communities. Developing and supporting innovative, accelerated training programs, for all levels of employees, will be necessary if the sector at large is to achieve its targeted manpower goals.

- **Strengthen mining-related disciplines at higher-education institutions.** Globally and nationally, there is a severe educational crisis in the engineering and scientific disciplines related to the coal mining upstream cycle. Major problems include undergraduate recruitment and enrollment, support and sustainability of graduate students and programs, and faculty succession and development of the future professorate in these fields. Mining-related disciplines in higher-education institutions must be reinforced, supported, and embraced by the broad coal community. Resources are needed to enhance student and program support and provide research funding opportunities that are necessary for the sustainability and growth of any discipline and professional field within the higher-education environment. Coal-related disciplines already represent a subcritical mass of effort that, without strong community support and commitment, may lead within a few years to critical technical and professional manpower shortages in the sector.

- **Expand training institutions and resources on a regional basis.** Building a workforce that supplies a sufficient number of skilled employees will require enhancing and expanding training centers and facilities. Companies, unions, private training vendors, federal and state agencies, and institutions should work together on this
effort. A network of community colleges and vocational schools is required to train workers regionally. Traditional training must be supplemented with new training options offered by advanced simulation and virtual reality. On-the-job training and apprenticeship programs for tradespersons need to be enhanced. Development of distance learning opportunities, including interactive, Internet-based training, and satellite television courses, will become necessary to meet training and vocational educational needs, particularly in remote areas.

- **Overcome perception problems of the coal mining sector.** The coal mining sector needs to overcome perception issues and public mistrust to become an employer of choice. The coal community must address its public image by promoting active community engagement, fostering pride in coal-related disciplines, and embracing the career-long development of and commitment to current and future employees. A community-wide program founded on building and facilitating public and private partnerships and focusing on improving the image of the coal mining sector as a good employer and responsible citizen is needed. Image improvement should be a major goal for the entire sector and coal community.