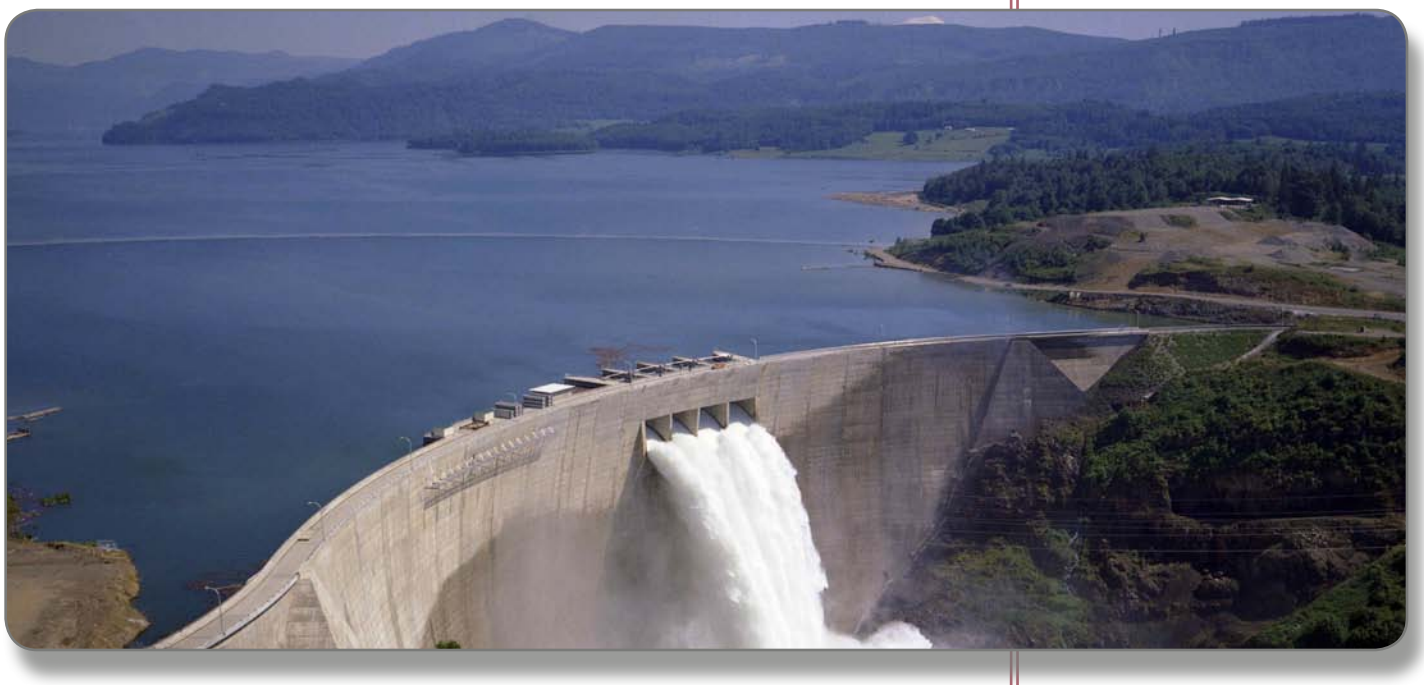
WORKFORCE CHALLENGES OF ELECTRIC SECTOR EMPLOYERS IN WASHINGTON AND OREGON



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WASHINGTON STATE UNIVERSITY
EXTENSION ENERGY PROGRAM

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About the WSU Extension Energy Program

Washington State University (WSU) is a recognized leader in energy research, development and technology transfer. The WSU Extension Energy Program works with government agencies, power marketers, utility consortiums, educational institutions, private businesses and industries on projects that promote energy conservation, research, development of renewable energy sources, and economic and workforce development.

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EXECUTIVE SUMMARY

The primary purpose of this study was to understand the employment and training needs of electric-sector employers in the Pacific Northwest region. The study focused on five occupational groups that comprise the largest number of craft jobs among electric-sector employers in Washington and Oregon: Operators, mechanics, electricians, technicians, and line workers. Quantitative and qualitative data were collected from 12 employers using a standard interview protocol. The results of this study identify several conclusions and implications that merit discussion among industry, education, economic development and workforce service providers. Some of the findings also have policy implications for state and local governments. A brief summary of those findings and implications are provided below:

"Employers forecast that they will lose 800 craft workers to retirements over the next five years, and they intend to fill all of those openings."

Conclusions

Labor Shortages Imminent: The 12 employers who participated in the study employ 3,349 workers across the five occupational groups. Only five employers plan to do any new hiring in these occupations over the next three years, however employers reported that they had a total of 276 job vacancies across the five craft occupations. Moreover, employers forecast that they will lose 800 craft workers to retirements over the next five years, and they intend to fill all of those openings. Since this study was based on a sample of employers, the true number of vacancies and future openings due to retirements is probably much higher.

Recruiting and Hiring Challenges: All employers reported challenges to recruiting and hiring craft workers. Chief among them are:

- A general shortage of qualified applicants
- Occupational shortages that cut across industry sectors

- Increased recruiting and hiring costs
- Filling the skills gap with subcontractors and overtime
- Adjusting hiring expectations due to the tight labor market
- Work conditions as a challenge to recruiting and hiring
- A lack of workforce diversity
- Specific hiring challenges, especially line workers, technicians and electricians

Workforce Succession Planning: Few employers have formalized processes in place to analyze, forecast and plan for future employment requirements in craft occupations. Many respondents said they did recognize the importance of having a formal workforce planning process, and that hiring challenges, external reports and internal data have caused executive managers to make workforce planning a higher priority. Some employers have comprehensive plans and processes in place.

IBEW Local 77 Apprentices raise the US flag at the Center of Excellence for Energy Technology 2007 Energy Summit

Photo courtesy of Seattle City Light

Two-Year College Connections Limited: Formal partnerships between these employers and local community and technical colleges are limited in number and scope. Apprenticeship is the most common connection between employers and colleges, and there are several examples of collaborative training programs. Outreach to colleges for recruitment is common, however partnerships with colleges regarding training programs for craft workers are not typical. Connections between these employers and local colleges appear to

be growing in response to labor market conditions.

Apprenticeship and Pre-Apprenticeship Trainees: A total of 349 apprentices were employed at 10 of the 12 companies included in the survey, accounting for more than 10 percent of the total workforce across the five occupations. Employers noted the high costs associated with apprenticeship; they conduct careful selection processes to ensure completion and retention. Several employers reported that they are now looking to expand apprenticeship programs in order to reduce the skill gaps that will occur due to retirements. Eight of the 12 employers reported that they routinely hire new employees into a trainee-level position that is preparatory to various craft occupations, but the numbers are generally small.

Building the K-12 Pipeline: All employers are concerned about the future supply of new workers, and whether they will have the skills to find employment at their companies. All employers reach out to K-12 schools and students in their areas, but most say that they did more in the past, and that they are not doing all they should to build a talent pipeline for the future. Employers are being more strategic, but the industry has an "image" problem that makes attracting students difficult. Employers emphasize the importance of math, science and other basic skills for craft jobs.

Implications

The Retirement Effect: Turnover due to retirements over the coming years could create a skills vacuum in some areas, as large numbers of highly-skilled workers retire and must be replaced by less experienced workers: 800 craft workers are expected to retire from these companies over the next five years, and employers report that all 800 of these positions will need to be refilled. Over half of utility workers in the region are 45 years of age or older, and general population forecasts show that over the coming decades the pool of working age adults will grow more slowly than adults reaching retirement age, which could create a more competitive environment for skilled craft workers. Large numbers of retirements by craft workers will necessitate internal promotions, upgrade training, and hiring replacements at each level. A smaller and less well prepared pool of future craft

workers will pose new challenges for electric-sector employers and the education and training programs that support them.

Industry Readiness: The challenges associated with recruiting, hiring and retaining craft employees have generally increased, and future retirements and a shrinking labor supply are likely to intensify competition for new and experienced craft workers. Although most employers are thinking strategically about risks and solutions to future labor shortages, few have developed formalized plans or processes to predict turnover, examine labor market shifts, and develop strategic solutions to fill future employment and skills gaps.

Short-Term Solutions and Actions: Employers have already begun to identify and implement solutions to reduce the effects of near-term labor shortages:

- Encouraging skilled workers to delay their retirement dates with incentives
- Re-hiring retirees to temporarily fill critical skill gaps, or to train new workers
- Restructuring jobs or increasing the use of technologies that reduce labor requirements
- Expanding internal and external training options
- Increased use of flexible compensation, benefits and other incentives to recruit workers

"Employers are concerned about the future supply of new workers, and whether they will have the skills to find employment at their companies."

Longer-term solutions: Employers need to enhance and build upon the existing workforce education and training systems that are already in place, while also pursuing new strategies to expand the pipeline of new talent for the industry. Apprentice craft workers now comprise more than 10 percent of all craft employment at these companies, but the number of new apprentice enrollments among these companies seems low in comparison to the number of predicted retirements:

- Restore training capacity: Employers and their union and edu-

cation partners need to restore apprenticeship training capacity to accommodate a larger numbers of trainees. Government support for apprenticeships would help employers offset some of these costs. Allowing college degrees, certificates and prior experience to replace some training requirements may help accelerate apprenticeship program completion.

- New programs: Employers, unions and education partners should identify current and future skill requirements for craft workers, and build new programs that support the workforce needs of the industry. Employers need to leverage the capacity of two-year colleges and other postsecondary institutions to help prepare new workers, for upgrade training, and to support employment growth in clean and renewable energy. Expanding career development opportunities for craft workers may help to reduce turnover, delay retirements, and control recruiting and training costs.

"The fundamental problem facing electric-sector employers is an inadequate supply of future craft employees."

Boosting the Labor Supply: The fundamental problem facing electric-sector employers is an inadequate supply of future craft employees. National and regional labor shortages, retirements and population shifts will intensify the competition for qualified workers. Expanding the supply of qualified craft workers will require regional, state and local initiative, with new strategies and resources aimed at both attracting young people to these careers, and preparing them to succeed in the workplace. Industry, secondary and postsecondary education, organized labor, workforce and economic development partners will need to work together to help grow the workforce. Some strategies include:

- Launch a formal marketing/outreach campaign: To help improve the image of craft jobs and to attract more young people to the industry.

- Expand work-based learning opportunities. Help expose students to craft careers and to emphasize the importance of solid basic skills.

- Targeted outreach to women and ethnic minorities: These populations are underrepresented in most craft occupations, and ethnic minorities will comprise a large source of working-age adults in the region.

Line worker training class

Photo courtesy of Avista

- Encourage student preparation: Encourage and support students to complete science, technology, engineering, and math courses in secondary school so they are well-prepared to enter apprenticeships, college degree programs and certificates that qualify them for careers in the industry.

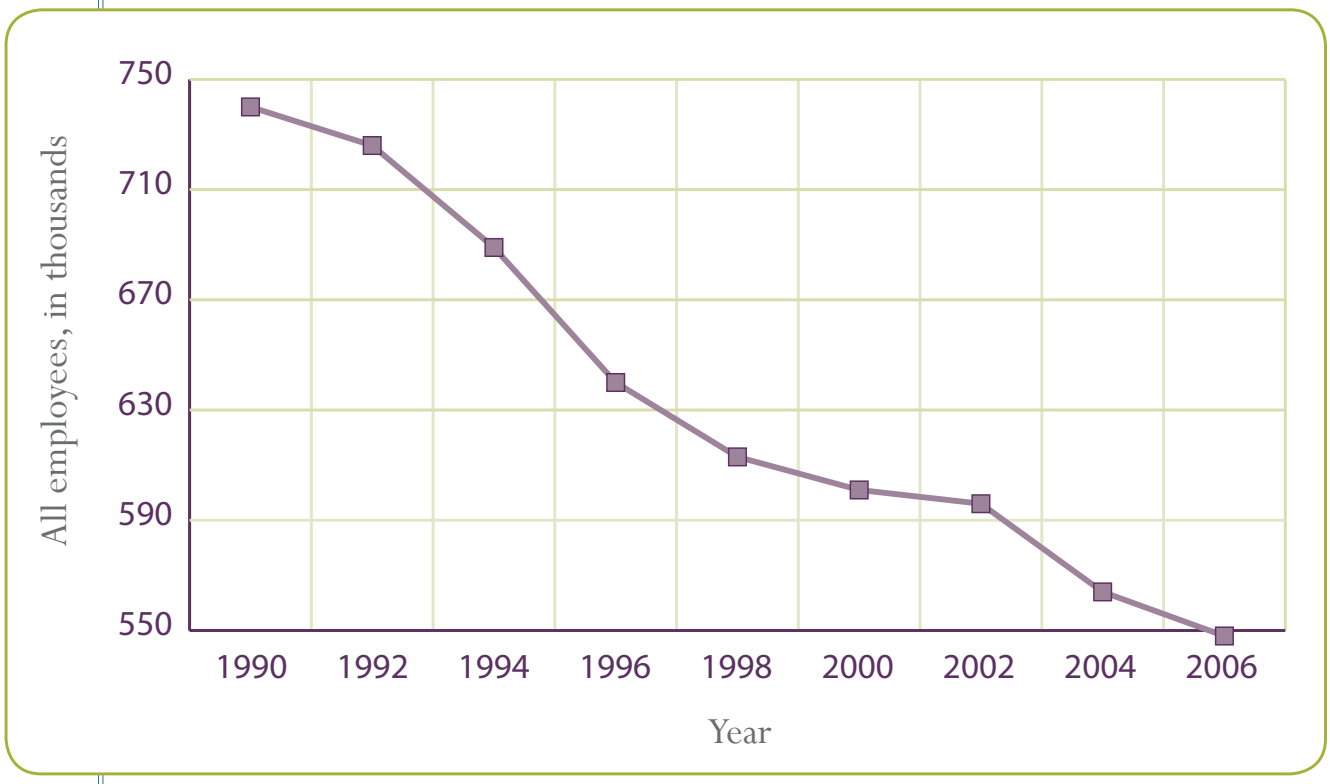
INTRODUCTION

The Energy Industry in Context

The U.S. energy industry has undergone a long cycle of consolidation and improved efficiency over the past 15 years. A major recession and efforts to deregulate the industry during the 1990s led many companies to merge and reduce their workforces, and to invest in new technologies to improve operating efficiencies. As shown in Figure 1, this led to a steady decline in energy utility employment that trimmed nearly 200,000 jobs over the past 15 years and reduced investments in education and training programs to support the industry.

Figure 1

U.S. Utilities Employment, 1990-2006[1]
(Seasonally adjusted)



Labor Shortages Predicted

A growing body of research and reports by industry trade groups suggest that there will be an exodus of highly-skilled utility workers in the next five to ten years due to retirement. Projections by the energy industry and individual companies about large numbers of employee retirements over the next decade raise important questions for the industry about its capacity to replace a highly skilled workforce.[2] In the electric sector, the projections are even more ominous. Nationally, 50 percent of electric utility workers are projected to retire over the next 10 years. This represents a loss of some 200,000 experienced workers.[3]

> *Nationally, 50 percent of electric utility workers are projected to retire over the next 10 years.... There is also some evidence that most utilities are not prepared to cover the skill gaps due to retirements.*

While the available studies and forecasts vary somewhat due to variations by sector, region and occupation, there appears to be strong evidence that the electric utility industry will face a significant challenge as experienced employees leave the industry. At the same time, sweeping demographic changes will result in a smaller pool of working-age individuals who are available to enter into employment at the entry level. The following sources underscore the growing concern about the future of the energy workforce:

- The U.S. Department of Energy found that the percentage of electrical lineworkers expected to retire within the next five to ten years could approach 50 percent in some organizations. The report concluded that while the number of lineworker training institutions has increased in recent years, there may be a national shortage of up to 10,000 qualified lineworkers, or nearly 20 percent of the current workforce.[4]

- The retirement effect is likely to be more challenging because of the massive hiring freezes and downsizing when the industry deregulated and focused on cost-cutting measures in the 1980s and 90s.[5]

- There is also some evidence that most utilities are not prepared to cover the skill gaps due to retirements. One survey of utilities in the Northeast found that 67 percent of utility companies surveyed had no succession plan for supervisors, and 44 percent had no plan for vice presidents.[6] The lack of succession planning for the engineering, executive and supervisory ranks raises similar questions about the level of planning that is happening for key hourly occupations.

"Not only does the [US energy] industry not have enough professionals and managers, but the skilled labor force will be severely affected [by the aging workforce]."

- In its 2006 long-term reliability assessment, the North American Electric Reliability Council (NERC) identified the aging workforce as a key challenge to future reliability of electric power.[7] The NERC report also noted the likely effect on the skilled craft workforce: "Not only does the industry not have enough professionals and managers, but the skilled labor force will be severely affected. Trying to get journeyman electricians and linemen will be more difficult than hiring the professional workforce."

- The shortages are forecast to be most severe for line workers, operators or technicians; however, the demand for engineers with power backgrounds has also increased. But there are dwindling numbers of students in the power engineering programs of universities that still have them. Electric power engineering programs in the U.S. now graduate around 500 engineers per year; in the 1980s, this number approached 2,000.[8] The Electric Power Research Institute found that the number of bachelor's degrees awarded in engineering and engineering technologies declined by 9 percent between 1990 and 2001.[9]

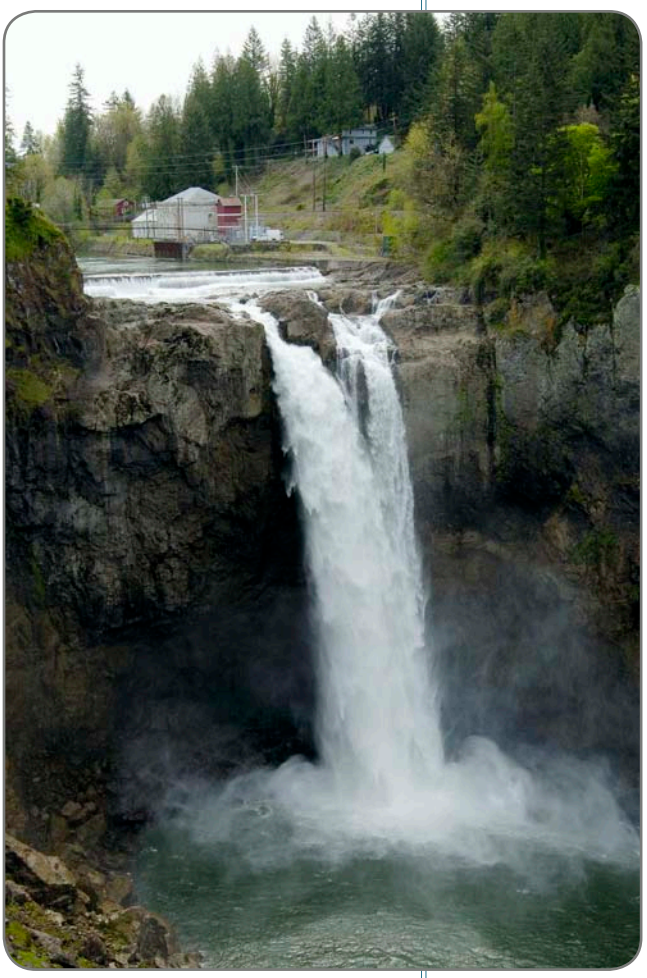
- Finally, a recent U.S. Department of Labor (DOL) Energy Summit meeting cited the impact of changing demographics on the energy workforce.[10] DOL noted that the energy industry is one of the first to feel the effect of Baby Boomer retirements that began this year, and that by 2030 almost 20 percent of the population will be 65 years of age or older. "Declining birth rates since the 1960s will make it unlikely that employers will be able to replace retiring workers at the rate at which they exit."

Recruiting, training and retaining new employees while also upgrading the skills of existing workers will become essential to ensuring that the future utility workforce is established and productive. But there are many unanswered questions about how this can best be accomplished. How can individual companies best prepare to identify, recruit and train incumbent workers to replace the highly skilled workers who retire? How will these organizations replace hourly workers and managers whose jobs become vacant due to internal promotions? What is the best way to transfer skills and knowledge from experienced workers to new hires?

This study begins to address these questions by focusing on some of the current challenges reported by electric sector employers in Washington and Oregon. The primary purpose of the study was to assess the current condition of the electric sector, the key workforce challenges facing employers, and to provide a benchmark to help the industry and its education and training, labor and workforce development partners identify strategies and solutions to these challenges.

The Electric Sector in Washington and Oregon

Electric power generation in the Pacific Northwest differs from the nation in its reliance on hydroelectric power sources. In 2006, coal accounted for nearly 49 percent of all electric power generation in the U.S., while hydroelectric accounted for only around seven percent. In contrast, hydroelectric sources provide the majority of energy generation in the Pacific Northwest region (see Table 1).



Snoqualmie Falls Project

Photo courtesy of Puget Sound Energy

Washington is the nation's leading hydroelectric power producer and exporter, supplying electricity to the Canadian power grid and even California. The state's electricity generation capacity is over twice that of Oregon's, due in part to larger hydroelectric capacity and a broader mix of sources of power generation. The region's capacity to generate hydroelectric power also provides an economical, carbon-neutral alternative to fossil-fuel-based power. But it is generally acknowledged that little additional hydroelectric capacity can be realized in the future.

Table 1

Total Electricity Generation by Source (in Megawatthours)
Washington and Oregon, 2006[11]
(Percent of Total)

Source	Washington	Oregon
Hydroelectric	75.8%	70.9%
Natural Gas	6.9%	20.9%
Coal	5.9%	4.4%
Other Renewables	2.3%	3.5%
Nuclear	8.6%	-
Pumped Storage	<.1%	-
Petroleum	<.1%	<.1%
Total 2006 Electricity Generation (in MWh)	108,203,155	53,340,695

"The region's large hydro-electric power base...supports thousands of high-paying jobs and the economic base of many local communities."

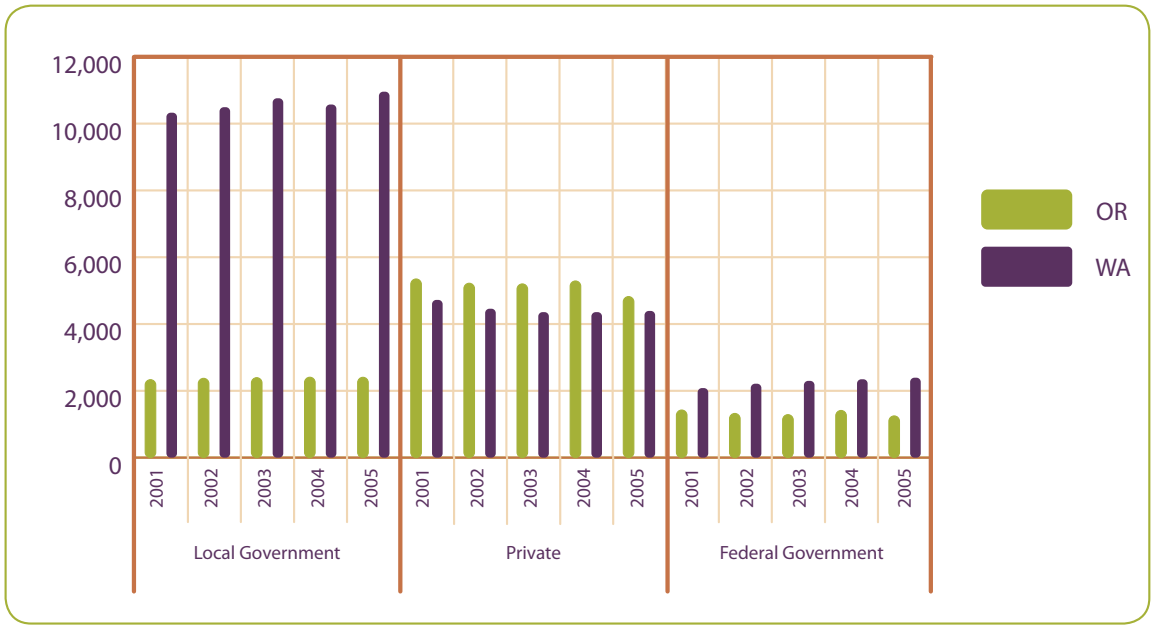
The region's large hydroelectric power base also supports thousands of high-paying jobs and the economies of many local communities. Natural gas, coal, nuclear energy and a growing number of alternative energy sources also account for many high wage jobs in the region.

During the mid-90s, however, many companies restructured, partially in response to a national recession and efforts to deregulate the industry. Many organizations worked to increase operating efficiencies by trimming their workforces, streamlining operations, and concentrating on core business functions.

During this period some regional companies sought to cut operating and labor costs by outsourcing some service functions, such as line work, to subcontractors. Although the industry experienced declines in the past, total employment in utilities has remained fairly steady over the last five years (see Figure 2).

Figure 2

Covered Employment by Utility Ownership
Washington and Oregon, 2001-2005[12]

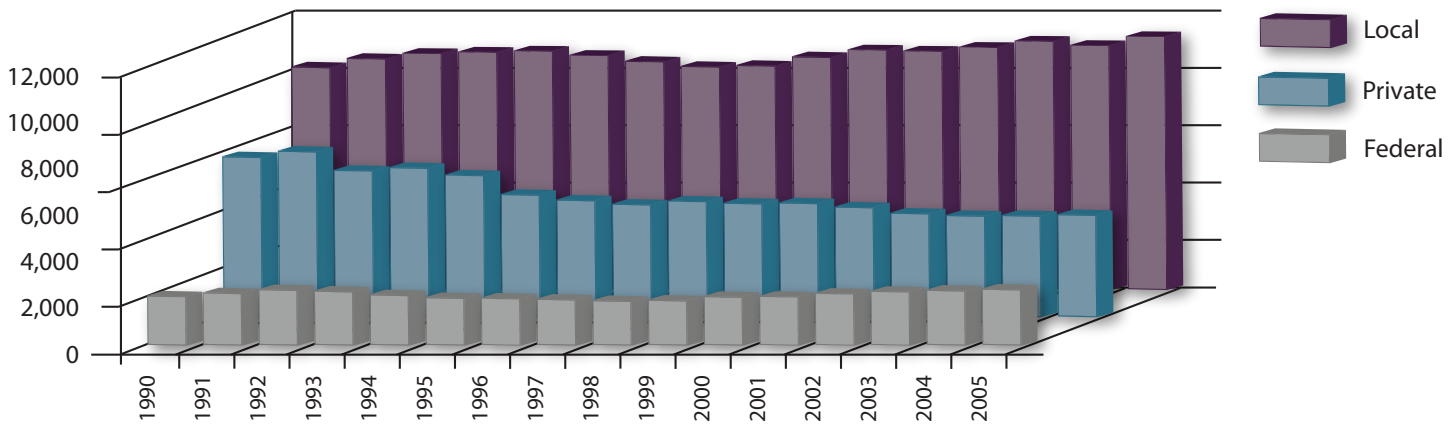


Although the industry experienced declines in the past, total employment in utilities has remained fairly steady over the last five years.

In Washington State, more recent changes in utility employment have been due largely to shifts among the three utility ownership sub-sectors (see Figure 3). Although employment in many private companies continued to shrink during the 1990s, in the late 1990s employment in federal and local organizations increased somewhat, as some federal agencies began to reduce their reliance on subcontractors for core services, restoring in-house capacity and expertise.

Figure 3

Washington State
Average Electric Utility Employment, 1990-2005[13]



At the local level, employment grew somewhat in public utility districts (PUDs), municipal utilities (such as Seattle City Light, Tacoma Power), and electric cooperatives, as they launched new services or expanded service offerings such as telecommunications. Many local organizations initiated major upgrades in their electrical, water and sewer systems that required additional craft workers. In part these efforts were aimed at addressing deferred maintenance of facilities and equipment, but also to expand service capacity to accommodate growth in commercial and residential construction. In Washington State, these factors combined to increase utility employment at the local level. While similar trends were occurring in Oregon, privately-owned utilities remained the largest employers.

The future of utilities employment in both states is expected to be stable, but with little new job growth. In Washington, private utilities employment is estimated to grow just 1.3 percent between 2004 and 2009, after which employment is forecast to remain flat through 2014.[14] In Oregon, private utilities employment is slated to increase only about 1.9 percent between 2004 and 2014.[15] Continued investments in technology and current efforts to increase energy efficiency

may moderate future employment demand.

It is important to note, however, that these estimates do not take into account potential new job growth due to changing market conditions or the development of alternative and renewable energy sources such as wind, solar, ocean and bio-mass. Renewable energy has gained increased attention in the region as a method for reducing green-house gas emissions, diversifying the energy base, and for boosting regional economic development.

An Economic Engine

Electric sector employment is a significant economic driver for the region. In a broad sense, the region's electricity infrastructure forms the foundation for economic prosperity in both states. An unstable electricity base would impair nearly all economic activity and growth in the region. By itself, the electric sector generates substantial economic activity. In Washington, total electric utility payrolls exceeded $1.1 billion in 2005. Total payrolls in Oregon that year were nearly $558 million.

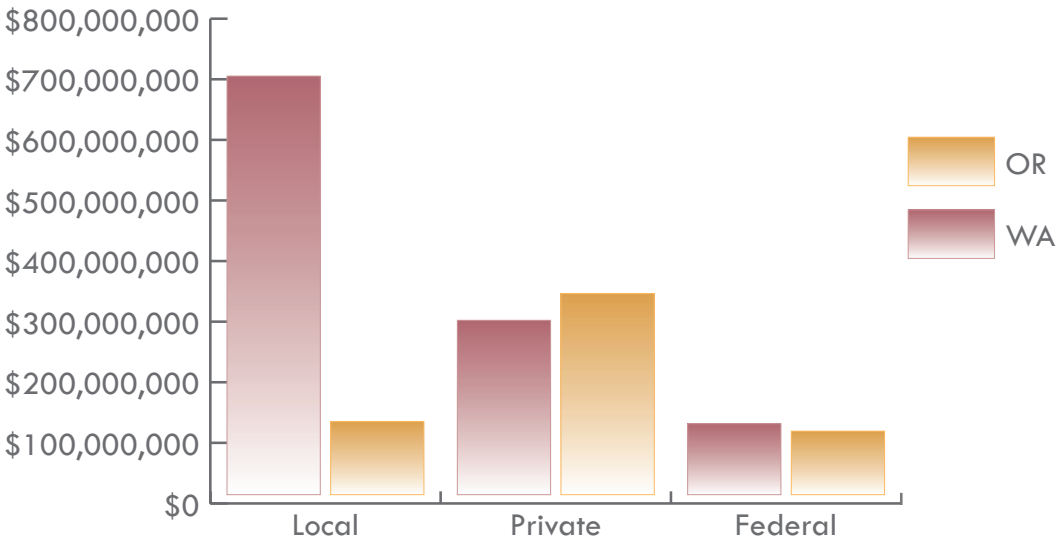
Workers service a wind turbine at the Nine Mile Canyon Facility

Photo courtesy of Energy Northwest

As shown in Figure 4, the largest payroll came from locally-owned utility organizations in Washington, which generated nearly $700 million in 2005. As noted earlier, the differences in payrolls between the two states are due primarily to a smaller number of local utilities in Oregon, which in 2005 supported less than half the employment of local utilities in Washington.

Figure 4

2005 Utility Payroll by Ownership
Washington ($1.6B) and Oregon ($558M)

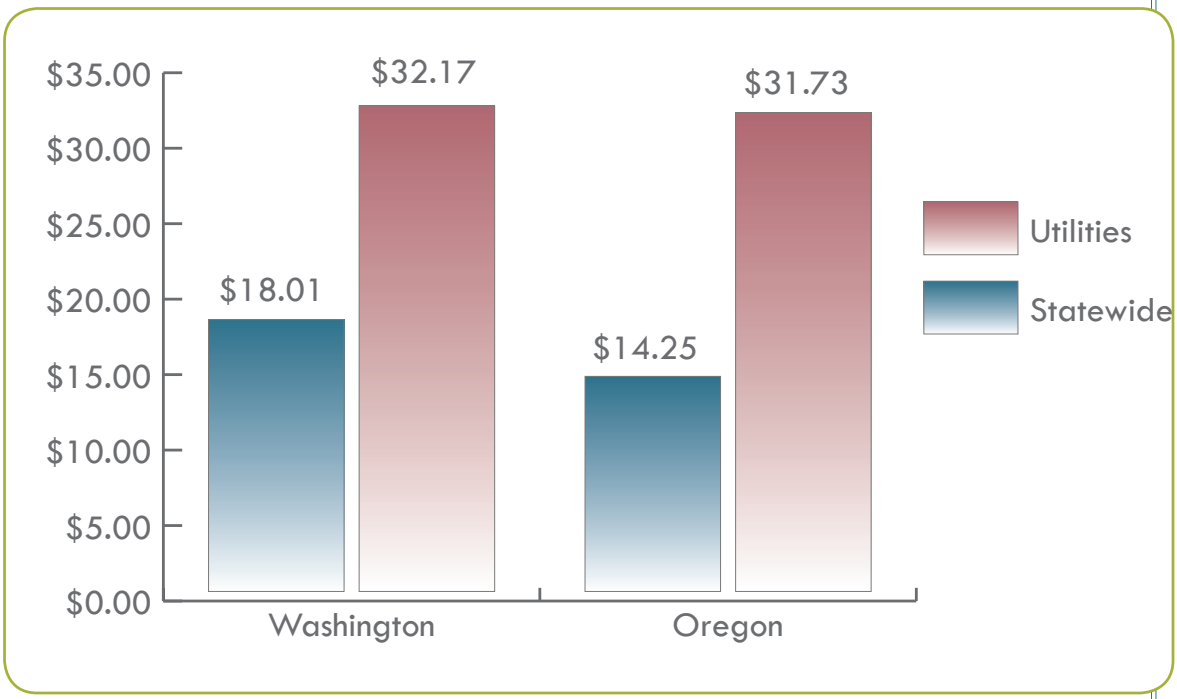


The contribution of utilities to the regional economy is also a function of high wages offered by employers. As shown in Figure 5, the median hourly wage for utilities employees in both states was considerably higher than for all state employment in 2005.[16]

In Washington, the average yearly wage for all utilities employment in 2005 was $65,140; in Oregon the average wage was somewhat higher at $65,794. There is also some evidence that wages are continuing to rise, due in part to growing labor demand and increased overtime. Average annual wages for employees of Washington privately owned utilities rose nine percent between 2005 and 2006 to $70,403. In addition to family-wage jobs, utilities typically offer employees excellent health care and retirement benefits.

Figure 5

Median Hourly Wages
Statewide vs. Utilities, 2005[17]

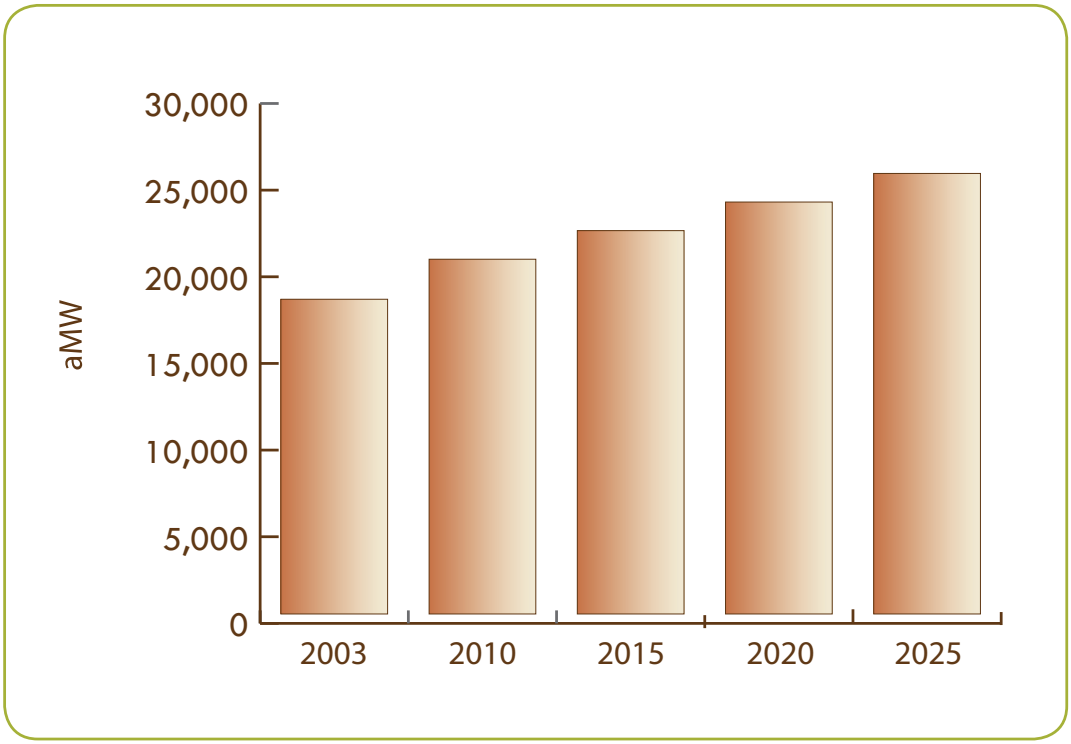


Meeting New Demand for Electricity

Moreover, the industry is poised for some significant growth over the next two decades. Between 2003 and 2025, demand for electricity in the Pacific Northwest is forecast to increase by around 40 percent (around 7,000 average megawatts); see Figure 6. And even with our efforts to be more efficient producers and consumers, including further development of alternative and renewable energy sources, it's likely that future demand for electric power will increase to meet the needs of future population growth and new business activity.

Figure 6

Pacific Northwest
Total Electricity Load Growth Forecast, 2003-2025
(Medium Forecast Scenario, in Average Megawatts)[18]



Clean and Renewable Energy

There is broad regional and state support for generating clean and renewable power in the Pacific Northwest, with support from federal legislation such as the Energy Policy Act of 2005. The recently-passed Green Jobs Act of 2007 (H.R. 6, Title X) creates an energy efficiency and renewable energy job training program, as well as research and grant programs to support workforce development for clean energy jobs. Washington and Oregon have also taken leadership roles in boosting the development of clean and renewable energy through legislative action. Political and financial support within the region has helped expand research and commercial development of clean and renewable energy, and has helped to promote the use

of new technologies to reduce greenhouse gas emissions and increase energy independence.

In 2008 legislation requested by Washington Governor Christine Gregoire was passed that calls for tripling the number of clean energy sector jobs to 25,000 in 2020. [19] There is clearly movement toward increased energy efficiency and the development and provision of renewable energy by electric utilities to reduce environmental effects, achieve energy independence and help meet future demand for energy services. To be successful, all of these initiatives require that a skilled workforce is available to fill the new jobs that these new technologies and processes will generate. Yet, it is unclear whether our region's education and training institutions are prepared to meet the demand for existing electric sector employees, much less the new labor demand from future growth in clean energy power generation, transmission and distribution.

Solar panels on the roof of Wenatchee Valley College

Photo courtesy of Chelan County PUD

Supplying an Educated Workforce

Regional employers are already faced with a shortage of skilled workers in the energy industry. In Washington State, the lack of skilled labor extends to several other industry sectors in the state. As shown in Table 2, utilities are not the worst off, according to employers. However, several of these industry sectors hire workers with similar skill sets that are transferable to the energy industry. Some of these industries currently serve as a secondary source of skilled labor for energy companies.

In short, labor shortages in related industry sectors, such as manufacturing, limit the ability of energy companies to recruit skilled employees outside their own labor pools. A shortage of qualified workers is likely to increase competition for employees within and between industries.

Table 2

Percentage of Employers Reporting Difficulty Finding Qualified Job Applicants by Industry Sector[20]

2001		2003		2005	
Agriculture/Food Processing	66%	Construction	65%	Construction	71%
Services	63%	Trade	51%	Agriculture/Food Processing	67%
Transportation, Utilities, & Government	**61%**	High-Tech	54%	**Transportation, Utilities, & Government**	**56%**
Manufacturing	60%	Manufacturing	49%	High-Tech	56%
Trade	58%	Agriculture/Food Processing	44%	Manufacturing	55%
Construction	48%	**Transportation, Utilities, & Government**	**42%**	Services	53%
High-Tech	47%	Services	38%	Trade	42%
All Industry Sectors	60%	All Industry Sectors	45%	All Industry Sectors	45%

Just as national declines in engineering and related technical programs are threatening the supply of an educated workforce in the U.S., enrollments and degree attainment in technical programs in Washington and Oregon have also seen either declines or modest growth. Many secondary vocational programs in the region have shrunk, and many high schools have seen technical preparation programs disappear entirely.

At the postsecondary levels, past trends show that enrollments in most engineering programs at regional four-year institutions have seen only modest increases. The number of baccalaureate engineering degrees awarded by public four-year institutions in Washington State actually fell by more than five percent between 1993-2005. While Oregon saw a 30 percent increase over the same period, in 2005-06 the state awarded only 811 baccalaureate degrees across all engineering and related technology disciplines.

The production of relevant two-year technical degrees is also modest in both states. In Washington, the number of associate degrees awarded in engineering and related technology programs remained flat from 1993-2005; a total of 513 associate degrees were award-

ed in 2005-06. Although Oregon saw a 32 percent increase in awards of engineering and related technician degrees from 1995-2005, the state's two-year colleges granted just 228 associate degrees in engineering and technology in 2005-06.

It is worth noting that in both states engineering and technology graduates are heavily recruited by a number of industries and companies. This means that utilities and other electric-sector employers and contractors must compete to attract and hire from a limited pool of local talent. Moreover, there are very few programs at either two- or four-year institutions in either state that are specifically designed to support the energy industry, much less the electric sector.

Population Dynamics: A Changing Labor Force

Just as the energy industry in the U.S. is faced with a current labor shortage and a looming wave of retirements, energy companies in Washington and Oregon will also face many of the same demographic challenges that will limit the availability of labor nation-wide.

Stator units at Grand Coulee Dam Third Powerplant

Photo courtesy of United States Bureau of Reclamation

Over the coming decades the pool of working age adults will shrink, while retirements among the most experienced workers in this industry will continue to grow. These factors may make it difficult for electric sector employers to attract and train employees to fill positions that become available due to retirements and internal promotions.

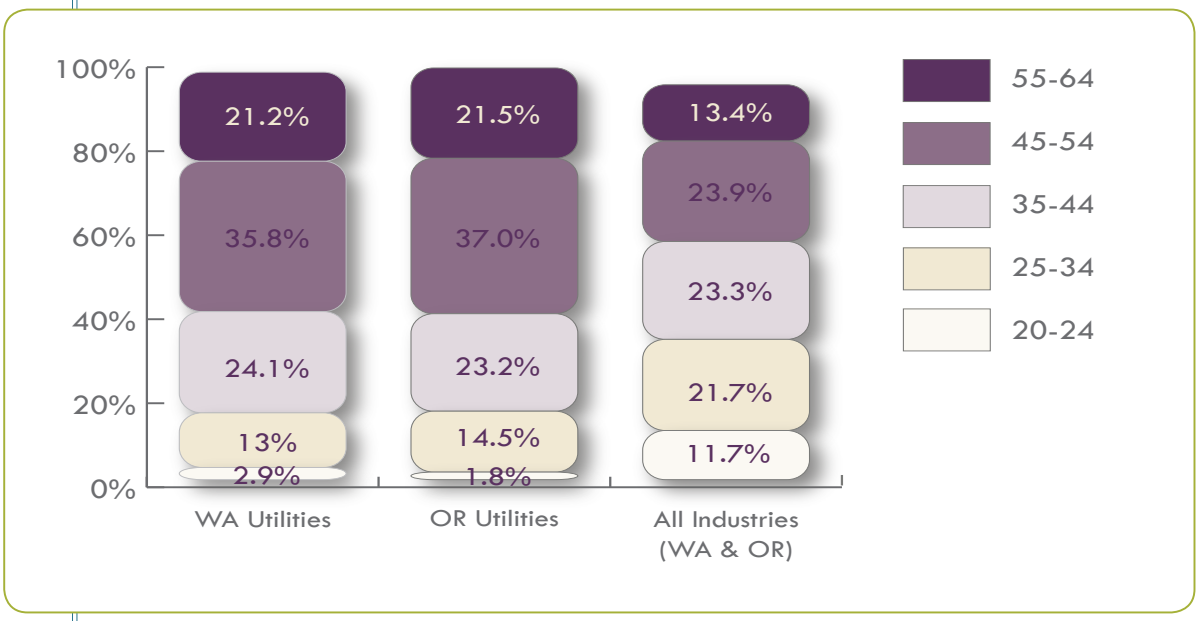
As shown in Figure 7, demographic profiles for the energy industry in Washington and Oregon are remarkably similar. Past cycles of employment reductions weeded out many of the younger workers with less seniority, leaving a large group of similarly-aged workers. The bar on the right (all industries, combined averages for both states) depicts a relatively normal curve or distribution of age cohorts. The other bars, however, show that compared to "all industries," the age cohorts for utilities are

unevenly distributed, with large cohorts of employees that are fast approaching retirement age.

The graph shows that 57 percent of Washington's utility workers were 45 or older in 2006. In Oregon this was true for more than 58 percent of the state's utility workforce.

Figure 7

Washington & Oregon Percent of Employment by Age Group (Utilities vs. All Industries) 2006 (Q1, Q3)[21]



These data suggest that for utilities, the supply of less-experienced workers will not match the demand generated by future retirements among more experienced older workers. In addition, broader demographic changes are likely to worsen the labor shortage for electric sector employers. As shown in Figure 8, long-term population forecasts show that the growth of working-age cohorts will slow considerably through 2030, even as the total population increases. In-migration will likely moderate the decline in labor force growth, but it will not reverse the trend.[22]

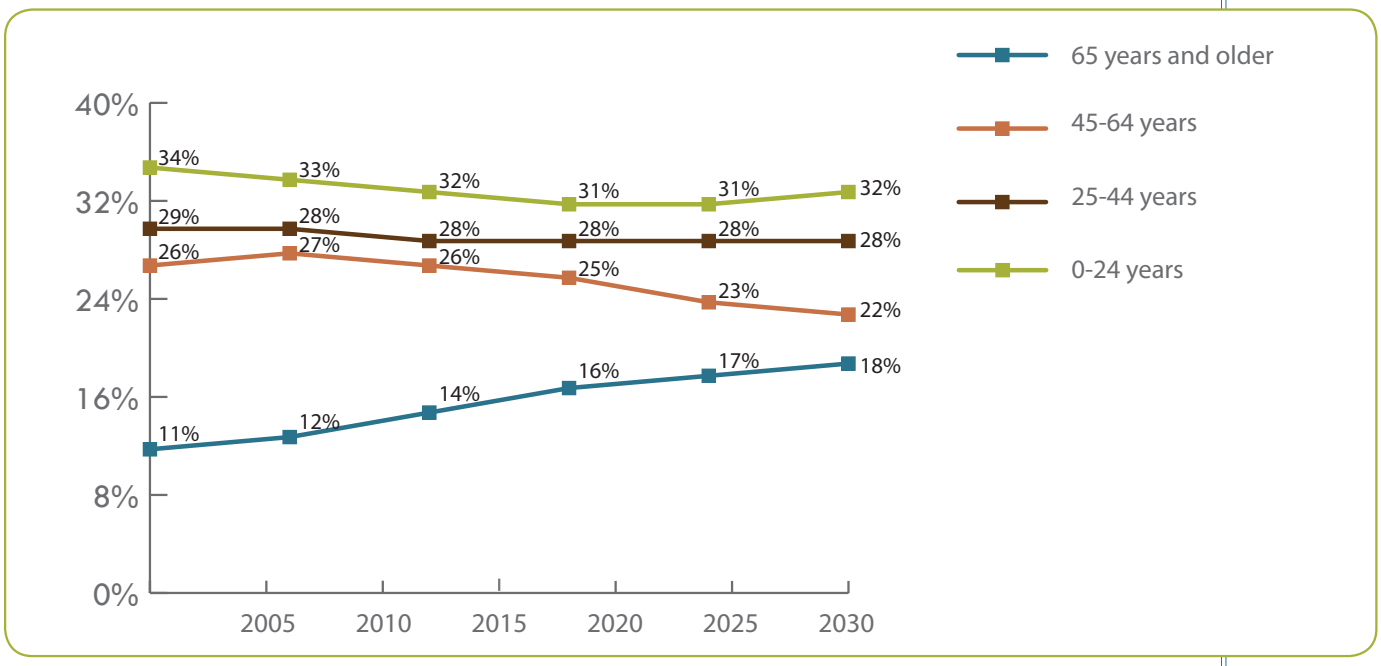
Related analyses show that the number of Washingtonians over 55 years old will increase by about 89 percent between 2004 and

2030, while those aged 16 to 54 will increase by only 22 percent. Projected changes in labor force participation rates, net migration, natural population increase, and aging of the population will continue to slow the state's labor force growth, especially after the Baby Boom generation reaches retirement age near the end of this decade.[23] Similar trends are predicted for Oregon.[24]

Although these forecasts suggest that labor shortages due to age cohorts are not just a challenge for utilities, they are likely to exacerbate the skills gap. The shrinking pool of working-age individuals is likely to make it more difficult for electric sector employers—and all employers—to hire new workers, or to recruit experienced workers from other industries or competitors. As some labor analysts have noted, the combination of slow growth in the future working-age population and the upcoming wave of retirements will force regional employers to make some adjustments to cope with these changing demographics.[25]

Figure 8

Washington State Population Forecasts
Percentages by Age Group, 2005-2030[26]



The future pool of new applicants is likely to be more ethnically diverse than it is now; but these same individuals may be less well prepared than those who have been hired in the past.

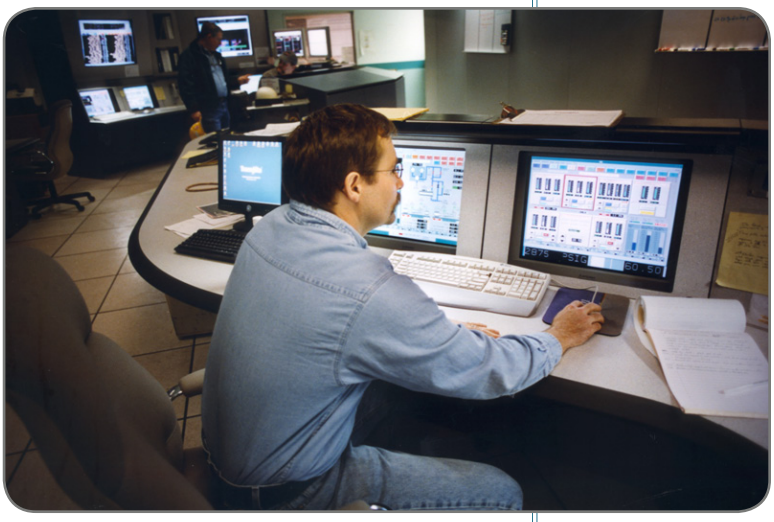
The racial and ethnic composition of the labor pool will also change. In Washington, nonwhite workers will account for 26 percent of the state's net labor force growth between 2005 and 2030.[27] Continued racial and ethnic diversification poses some critical issues for employers, including those in the electric sector. As new technologies and process changes continue to be implemented, employer expectations about the skill levels required of workers have generally increased. But participation rates of non-whites in secondary and post-secondary education are widely known to be far below those of their white counterparts.[28] For instance, in 2000 only 53 percent of the Washington Hispanic population 25 years or older completed high school or equivalency, compared to 90 percent of whites in the same age group.[29] More recent data shows that college enrollments and degree completion rates in Washington State continue to be lower for Hispanic, African American and American Indian students than for whites and Asians.[30]

In short, the future pool of new applicants is likely to be more ethnically diverse than it is now, but these same individuals may be less well prepared than those who have been hired in the past. Thus, another challenge to electric sector employers is how to support the educational and skills development of this growing segment of the population so they are qualified for employment.

Research Methods

The author met with project sponsors and stakeholders to determine the design for this project. It was decided that telephone interviews of a sample of electric sector employers in Washington and Oregon would be conducted. Telephone interviews were deemed preferable to a mailed questionnaire or internet survey because of the qualitative nature of many of the questions. The one-on-one nature of the telephone interviews also helped to ensure good response rates from the industry and enabled data clarification and additional data collection from multiple sources.

A total of 13 electric sector employers were identified by the project sponsors. Contact information was collected for each company; some employers were identified by sponsors who had personal contacts at most of these companies. The Director of the Center of Excellence for Energy Technology at Centralia College and the Industry Chair of the Energy Technology Skills Panel distributed an email note to each company, extending an invitation to participate. The invitation included a formal letter and an information briefer explaining the purpose of the study and topics and assuring confidentiality. Only one employer was unable to participate.



Control Center

Photo courtesy of TransAlta

The research design identified a range of organizations to include in the study. The goal was to achieve a reasonable representation of the electric sector in the Northwest within the parameters of the project time line and resources. While the focus included a major-

ity of large public and private utilities, regional and local organizations such as public utility districts and independent power producers were also included. An effort was also made to include organizations representing power generation, transmission and distribution. Several hydroelectric employers, one nuclear energy producer and one thermal-based electricity producer were selected. The 12 participating employers are listed in Table 3.

Table 3

Participating Employers

Employer	Employment
Avista	1,476
Bonneville Power Administration	2,914
U.S. Bureau of Reclamation	1,187
Chelan County PUD	774
Energy Northwest	1,155
Grays Harbor County PUD	171
Portland General Electric	2,651
Puget Sound Energy	2,500
Seattle City Light	1,713
Snohomish County PUD	934
Tacoma Power	633
TransAlta	359
Total Employment	16,467

Employer Interviews

A detailed interview protocol was prepared that included questions on the following categories of information:

1. Current and Future Employment Demand in Primary Occupa-

tional Groups (see "Occupational Groups" section below)

- Hiring trends and forecasts
  - Total employment (all employees) and in each of the five occupational groups
  - Current vacancies
  - Hiring challenges
  - Retirement forecast/estimate (5 years)
  - Future employment forecast/estimate (3 years)

2. Skill and Degree/Certification Requirements
   - Electronic/written job descriptions for primary occupations

3. Workforce/Succession Plans and Strategies
   - Does a formal workforce or succession plan exist?
     - Level of detail/content, emphasis areas and strategies

4. Partnerships with Regional Colleges and Training Providers
   - Established partnerships with certain colleges or training providers
     - Primary kinds of training provided

5. Apprenticeship
   - Apprenticeship programs for the primary occupations
     - 2006 enrollment slots and selection criteria
   - Pre-apprenticeship programs

6. Outreach to K-12 Schools and Students
   - Outreach to secondary schools and students
     - Effective strategies

Interviews were conducted between June and November 2007. A total of 24 interviews were conducted across the sites. Interviews typically lasted between 40-60 minutes. In most cases, due to incomplete data or questions about data elements and forecasts, the quantitative data was integrated and returned to contacts at the company, who subsequently verified or corrected the data.

Typically, interviewees included the human resources manager but sometimes included one or more of the following:

- Training and development managers
- Business development managers
- Operations managers
- Engineering managers

Occupational Groups

It was determined during the design phase of the project that the primary units of analysis would be five different groups of hourly workers who are directly responsible for the operation, installation, repair or maintenance of electric-sector power generation, transmission or distribution systems and equipment:

- Operator (system and plant operators, all levels)
- Mechanic (plant and system mechanics, all levels)
- Electrician (plant, "wiremen" and substation electricians)
- Technician: Instrument/Control/Relay/Meter (all levels of technicians; does not include drafting or other non-energy system technicians)
- Line Worker (all levels of line workers, excluding communications/fiber line workers).

Study Limitations

This study relied upon self-reported data collected from 12 electric-sector employers. The survey design process included detailed reviews of available background data, selection of a diverse range of employers representing the sector, and the development and use of a standard data collection and interview protocol. The survey of employers did not employ a statistical sampling procedure, and Oregon employers were underrepresented. Thus, the study findings may not accurately represent the conditions of other electric-sector employers in the region.

Findings

The data analysis approach summarized the quantitative responses and identified the primary themes contained in the qualitative responses. All findings are presented in aggregate form to ensure confidentiality.

Staffing Trends: Current Staffing and Projections

The first set of interview questions focused specifically on budgeted staffing patterns as Full Time Employees (FTE) in each of the five occupational groups. Projected FTE growth, retirements and retiree replacements, and current job vacancies were also the focus of data collection and analysis in this section.

Current Employment

As shown in Table 4, the five occupational groups comprise just over 20 percent of total employment in the 12 organizations. Line workers comprise the largest group with 1,076 FTEs. This represents 6.5 percent of total employment across the 12 organizations. Electricians represented the second-largest group with 664 FTE (about four percent of total employment), followed by Operators (610), Instrument/Control/Relay/Meter Technicians (565), and Mechanics (434), respectively.

Table 4

Current FTEs per Occupational Group

Occupational Group	Number of Companies Employing Occupational Group	FTEs	Percent of Total Employment
Operator	11	610	3.7%
Mechanic	11	434	2.6%
Electrician	12	664	4.0%
Instrument/Control/Relay/Meter Technician	12	565	3.4%
Line Worker	10	1,076	6.5%
Total Employment in the Occupational Groups	12	3,349	20.2%
Total Employment, All Employees/ Employers		16,467	100%

During the interviews with employers, it became evident that the functional divisions between these five occupational groups were not always clean. For example, in some organizations the job title of "wireman" was the term used to describe a substation electrician. In other cases, the duties inherent in some jobs included work that traditionally was performed by workers in other job classes. This was most common in jobs that were located in rural or remote areas, where employees were often expected to serve as "generalists" rather than as specialists. In some cases this was due to the large geographic areas that individuals or crews were assigned to cover.

The physical distance between work stations, personnel, supplies and population centers were other reasons that workers in remote areas were required to cover many different job duties. In other cases the crossover between job duties was a function of the diversity of job

functions and services offered by the employer. Compared to other employers, public utility districts were more likely to emphasize the need for job skills that cut across several different crafts.

The majority of employers confirmed that total employment in these occupations generally declined during the 1990s due to widespread consolidations in the industry brought on by deregulation and the national recession. Several noted that these factors also led to an increase in the use of outside contractors to further reduce costs in some occupations, especially line workers.

Projected Three Year Staffing Trends

With a few exceptions, most employers reported that they do not expect to expand their total head count over the next three years. Although all employers anticipate there will be considerable turnover due to retirements (and they plan to fill all of these vacancies), only five employers said they plan to hire new employees above and beyond current vacancies or retiree replacements.

Substation 10

Photo courtesy of Snohomish County PUD

As shown in Table 5, total new hiring is expected to be marginal, with an overall increase of only 2.4 percent in these occupations through 2009. Many organizations reported that while they are working to achieve greater productivity and operating efficiencies, much of these gains will come through new investments in technology and improved work processes that may actually moderate their need to increase employment beyond currently-budgeted staffing levels. Other respondents indicated that while they do have a number of current vacancies (see Table 5), their organizations anticipate fairly stable levels of near-term electricity demand so they do not see a need for additional employment in most occupations.

Table 5

Projected Staffing
Change in FTEs per Occupational Group
2007-2009

Renewable and Clean Energy Jobs: While the vast majority of employers said they did not anticipate much new hiring will be required over the next few years, several respondents pointed to clean and alternative energy as a likely long-term source of new job growth in their organizations. Several large employers have already invested in developing or expanding alternative sources of electric generation, such as wind, solar and ocean-based energy.

Occupational Group	Number of Employers Projecting New Hires	Net Growth in FTEs	Percent Growth in FTEs
Operator	1	4	0.7%
Mechanic	1	3	0.7%
Electrician	2	3	0.5%
Instrument/Control/Relay/Meter Technician	1	11	1.9%
Line Worker	2	59	5.5%
Total New Employment in the Occupational Groups	5	80	2.4%

Although it is likely that there will be a need for employees to support operations and maintenance of these new energy systems, several respondents noted that these jobs have jet to be defined. Indeed, several employers said they are not sure what the skill requirements for those jobs will be, or if a pool of qualified candidates will be available when they are needed.

Retirements and Turnover

As mentioned earlier, most companies expect that there will be considerable turnover in these occupational groups due to employee retirements over the next five years and beyond. Most respondents indicated that turnover due to reasons other than retirement is extremely low. One exception is for line workers, where lucrative offers from competitors have resulted in higher than anticipated turnover in some organizations. Overall, however, the primary concern voiced by respondents was that such a large group of employees are becoming eligible for retirement at the same time. For example, one respondent reported that his company expects a total of 122 retirements across these occupational groups over the next five years. This same employer anticipates that more than 40 percent of current employees in each of the five occupational groups will retire in the next five years.

As shown in Table 6, employers anticipate that over the next five years 800 retirements will occur, which represents nearly 24 percent of employment across the five occupational groups. While the total number of retirements is highest for line workers (215), on a percentage basis technicians are forecast to retire at the highest rate among the five occupations (33.3 percent), followed by mechanics and electricians, respectively.

Employers also expressed their intent to fill positions that become open due to retirements. In fact, every employer interviewed for this study reported that they plan to hire or promote and re-train existing employees to fill all openings that will become available in their organizations due to retirements over the next five years.

> *Although all employers anticipate there will be considerable turnover due to retirements (and they plan to fill all of these vacancies), only five employers said they plan to hire new employees above and beyond current vacancies or retiree replacements.*

Table 6

Projected Retirements in FTEs per Occupational Group
2007-2011

Occupational Group	Number of Employers Projecting Retirements	Net Retirees	Percent of Current Workforce
Operator	11	100	16.4%
Mechanic	10	133	30.6%
Electrician	11	164	24.7%
Instrument/Control/Relay/Meter Technician	12	188	33.3%
Line Worker	9	215	20.0%
Total Retirements in the Occupational Groups		800	23.8%

"Overall... the primary concern voiced by respondents was that such a large group of employees are becoming eligible for retirement at the same time."

Current Vacancies

Employers reported a total of 276 current job vacancies across the five occupational groups. If all positions were filled, total employment in these occupations would be around 8.2 percent higher than was reported. As shown in Table 7, technicians accounted for 106 vacancies (38 percent of all openings). Filling all technician openings would increase total employment in this occupation by around 19 percent. It should be noted that technicians comprise a diverse occupational group and are employed by all 12 organizations, which could account in part for the large number of openings.

Table 7

Current Vacancies per Occupational Group

Occupational Group	Number of Employers with Vacancies	Number of Vacancies
Operator	5	33
Mechanic	8	28
Electrician	8	35
Instrument/Control/Relay/Meter Technician	8	106
Line Worker	9	35
Total Vacancies in the Occupational Groups		276

In light of interview data collected from employers regarding hiring challenges (see "Recruiting and Hiring Challenges" section below), the number of vacancies reported does not seem especially surprising: Some employers expressed great difficulty finding qualified applicants, while others were attempting to fill vacancies internally through upgrade training and employee promotions.

It should be noted that these data represent a snapshot view of openings at the time of the interviews. Of course, employment openings are in a constant state of flux, so these numbers may or may not be representative of the overall hiring landscape at other times. Several employers noted that they had "just filled" one or more positions in some of these areas.

Recruiting and Hiring Challenges

Feedback from respondents suggests that competition for skilled craft employees is increasing. Many employers reported it has become harder to recruit, hire and retain qualified craft workers. Although most employers do not anticipate much new employment growth in the next few years, there are ongoing concerns about their ability to fill current vacancies and future openings due to retirements.

General Hiring Challenges

As noted above, the 276 job vacancies for the five occupations provide one indicator of hiring demand reported by these employers. And while this number is just a snapshot of hiring demand, interviews with employers revealed that there are a number of pervasive hiring challenges, and that some of the underlying causes are structural, not temporary. General challenges cited by all or most employers include the following:

Shortage of Qualified Applicants: Nearly all employers reported that the pool of qualified applicants for these positions is shrinking, especially at the journey-level. Some employers noted that the lack of qualified applicants was due to a general tightening of local energy labor markets, which they attributed to retirements and a "seller's market" in which employees have many employment options. Other employers said that with the aging of the workforce, more employees have families with children and roots in their communities, and many do not want to relocate to take a new job, even if the assignment or compensation package is better.

Shortages Cut Across Industry Sectors: Some employers have filled craft job openings by recruiting from other industry sectors, such as manufacturing. One employer noted that his company regularly recruits electricians from the pulp and paper industry. In part, this was an effective strategy because downsizing in the wood products industry made skilled labor available. Another advantage was that the skill sets of electricians in both industries were fairly similar, which meant that less training time was required to help the new employee become productive. This same employer has observed, however, that

there are growing shortages of skilled electricians across different industry sectors, which has intensified competition between employers and has rendered this strategy less effective for them.[30] He noted: "We generally look for an industrial type electrician as our outside labor pool, and since the manufacturing industry has declined in the Northwest, so has the pool of qualified electricians."

A few employers noted that the construction boom in their area has also intensified competition for journey-level electricians. While the residential construction market has cooled off considerably, commercial construction projects—which employ industrial electricians with more high-voltage experience—are still underway, and it is often hard to compete for those workers because they have many options and are already highly paid.

Traditional Recruiting Strategies Inadequate: According to many employers, these shortage conditions have made it increasingly difficult to successfully recruit using traditional methods alone. For instance, several employers noted that in the past a relatively large, mobile labor pool offered them a larger number of qualified applicants to choose from. That pool usually consisted of local or regional applicants who had a working knowledge of the industry, and specific skills that helped them become productive more quickly. "Poaching" qualified employees from competitors by offering better compensation, working conditions or assignments has long been a common practice that helped these organizations to fill critical skill gaps. The problem, said several employers, is that the pool of new workers has shrunk, and many older workers are not as interested in changing jobs or relocating. One respondent noted: "We're not even stealing from each other much anymore, qualified people are just not available, they're not floating around out there."

Increased Recruiting and Hiring Costs: Nearly all respondents reported that the amount of time, effort and resources they devote to recruiting qualified employees has increased over the last few years; most employers tied the extra effort directly to a tighter labor market. Typically, now these companies have to recruit more heavily, and in order to generate an adequate pool of applicants they have been forced to advertise and recruit more aggressively. Most respondents

noted that they have expanded recruitment of out-of-state candidates because they are not available locally. Several employers noted that competition for qualified line workers is especially intense. One respondent noted: "Lineman turnover has been high, and it has been a surprise to us. And the losses seem to be in critically-important crews and in remote areas, where they're really hard to replace. They have so many options. It's a seller's market."

With fewer candidates to choose from, there is increasing pressure to offer enhanced compensation packages, signing bonuses and other inducements to secure high-demand employees; some out-of-state candidates are reimbursed for relocation expenses or housing costs. Some governmental employers reported that they're often at a disadvantage because they lack the flexibility to adjust compensation to more closely match the wages and benefit packages offered by private industry.

Filling the Skills Gap: Labor shortages and rising subcontracting costs have led some organizations to expand their use of overtime to fill employment gaps. While overtime is a common expectation among energy industry employers—mandatory overtime is typically a condition of employment—some respondents reported that they are even more dependent on existing employees to get the work done than in the past. One respondent noted: "Decisions about new hiring are based on the budget, and a lot of our additional work is better handled through the use of overtime. It costs a lot to add bodies, and in the short run it's cheaper to fill the workload with OT." Many companies use outside contractors to supplement their capacity to cover workload peaks due to planned maintenance or storm damage. This practice is most prevalent for line work, but can also extend to other occupations such as mechanic or electrician. One employer noted, however, that while relying on outside contractors offers many advantages, the benefits often come at a price: "We do need more capacity in line work. Part of that is the amount of work, and part is the increasing cost of using outside contractors, they're getting more expensive."

Another respondent noted that the use of outside contractors also can affect how much control management has, including the company's

> *"Interviews with employers revealed that there are a number of pervasive hiring challenges, and that some of the underlying causes are structural, not temporary."*

relationship with its customers: "By outsourcing, you lose that internal expertise, but you also lose some direct contact with the customer." Another employer was even more cautious about the use of subcontractors for some core functions:

> We have no intention of outsourcing craft jobs to contractors, we don't want to do that. Our superintendent thinks our distribution system is the heart of what we do, so to let someone else do that seems wrong. We also want control over those functions, and our customers want the personal touch, to know we've got things under control and that we'll do it right. We want to own it. Contractors have a different attitude about service, they want in and out. It's a different mind set.

Transmission Towers at Sunset

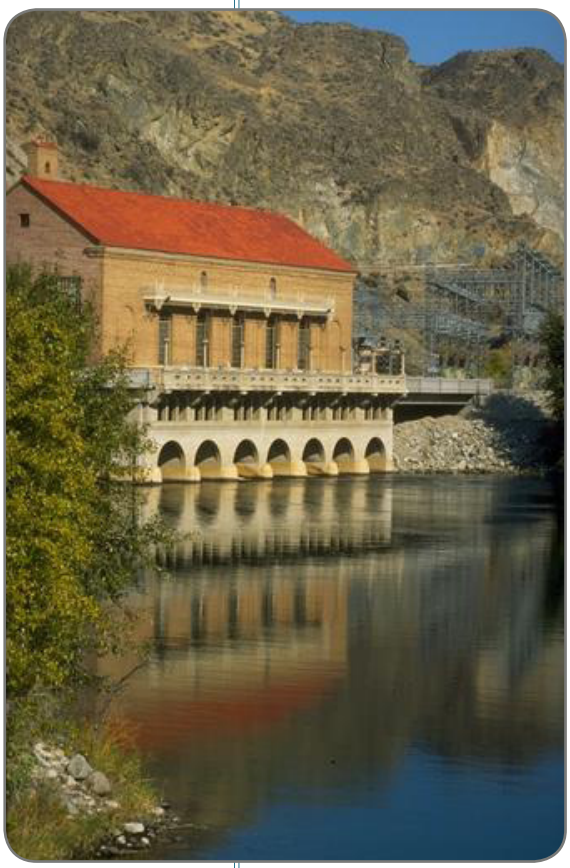
Photo courtesy of United States Bureau of Reclamation

This same employer, however, also reported that contractors control the majority of all line workers in their region, and that they tend to pay a higher hourly wage than most utilities are able to offer. She believes that this also limits her organization's ability to recruit new, younger employees, who are more interested in high wages than benefits or employment stability: "Contractors control about 80-90% of linemen, and they pay around $6 more per hour, and there are other incentives, even though the benefits are not so good as ours. But, for many younger workers, the high wage and overtime is very attractive. A lot of them, they don't have families to worry about."

Adjusting Expectations: There is some evidence that the shortage of qualified labor has caused employers to moderate their expectations and adjust their selection processes in order to meet recruiting goals. Although it is not clear if this is a widespread trend or merely a temporary tactic used to fill critical skill gaps, several companies agreed that they have had to be somewhat more flexible in their hiring pro-

cess in order to fill some positions. In a few instances respondents said that they've had to compromise their hiring standards somewhat in order to fill a critical need. One employer put it this way: "In some cases we're left having to take anyone who is remotely qualified." Another employer noted how they modified their selection process to keep from losing qualified applicants to other organizations:

> The shortage of qualified applicants has moderated our expectations. We'd like to see better applicants, but we can't find them. We used to use a written test as part of our hiring process, but we got rid of it since a lot of applicants just couldn't pass it, and we found that it was just another hurdle for them, and for us. We're now trying to shorten the recruitment cycle, reduce the number of steps, because we don't want to lose good applicants. We've lost some good ones to other companies who were willing to forgo other testing and just take the journeyman's card.



Chelan power house

Photo courtesy of Chelan County PUD

Working Conditions: As the pool of available labor shrinks, qualified applicants have more employment options and greater ability to negotiate work conditions. While many of these jobs are physically demanding and require employees to deal with various safety hazards, emergency situations and inclement weather (see job requirements summary in Appendix A), some employers noted that many applicants look for positions with less travel, often declining assignments in remote locations. One respondent noted that work conditions are not necessarily better based just on geography. In urban settings, for instance, line work and other maintenance is often done in tight quarters on busy streets, which adds to the stresses of the job:

> [City] is pretty dense, the work is pretty physical. Sometimes we can't use bucket trucks, so there's lots of climbing. High density means more lines, so the workload can be pretty high. Often we're dealing with high voltages too, and we have large crews since we do a lot of heavy construction, the work is very physically taxing. The bulk of our jobs require heavy

work, they're big jobs, with big crews. Rural areas tend to be more relaxed, not such tight quarters, with less heavy construction. The nature of the work forces some folks into retirement earlier, or they pursue some other kind of work or career.

Remote assignments and travel requirements also factor into applicants' employment decisions. The lack of "local" talent in remote communities has meant applicants often come from urban settings. Growing a local talent pool is viewed as an ideal strategy, since these individuals often have family connections, and they are familiar with the benefits and limitations of remote communities. Many employers noted that filling openings in remote locations is hard because there are fewer housing options, amenities and cultural activities than in larger towns and cities. But most employers have at least some remote facilities and systems maintenance needs; some have a large number of remote substations, dams and other facilities that require employees to live in close proximity to their work. One respondent described the problem this way: "We have a big substation in [Location], but we have a hell of a time recruiting out there. Lots of the people we're trying to recruit, they're married and there's no place for their spouses out there, there are few jobs and you're miles from major cities."

"With fewer candidates to choose from, there is increasing pressure to offer enhanced compensation packages, signing bonuses and other inducements to secure high-demand employees."

Travel requirements can also be extensive, and employers with facilities in rural areas of the state frequently cited travel as a hiring factor. One employer noted: "Finding qualified applicants who are open to travel is becoming increasingly difficult. Travel used to be an accepted norm, but newer generations don't seem to want to travel as much. Neither do employees with families. And they don't want to go up on those high voltage towers in the winter!"

Diversity Lacking: A number of respondents reported that finding qualified women and minority applicants is one of their major recruitment and hiring challenges. And, with a general labor shortage, attracting and hiring women and minorities has become even harder. Several employers explained that their workforce often does not reflect the demographic makeup of their community. Most employers have expanded their efforts to recruit and hire more women and ethnic minorities through special recruiting events and presentations to professional associations and student groups.

Some respondents commented that even if they are able to recruit and hire ethnic minorities into craft positions, assigning them to work in jobs at remote sites can be difficult due to the isolation and related factors that make remote locations unattractive for many employees. Several employers reported that in many small communities the population is so homogeneous that it can be hard for minorities to "fit in." One employer noted: "As a business, we struggle to diversify our ethnic composition, but in some of the outlying areas, they're very homogeneous culturally, there are not a lot of minorities, and sometimes they don't feel welcome. They don't fit in very well."

"the shortage of qualified labor has caused employers to moderate their expectations and adjust their selection processes in order to meet recruiting goals."

Specific Hiring Challenges

Employer responses regarding hiring challenges for specific positions were varied. Often the same challenges noted above pertained to several occupations. In some cases, hiring challenges for specific positions cited by one or two employers were non-issues for other employers. Obviously, many factors can influence how challenging an employer's recruiting and hiring efforts are, from the type of work assignments, geographic location, and local labor supply, to how competitive their compensation structure is. Table 8 ranks the relative difficulty of recruiting and hiring qualified workers for each occupation. The rankings are based on employers' descriptions of the hiring challenges and integrate analyses of employment numbers and vacancies.

Overall, employers reported that recruiting and hiring qualified line workers has been their biggest challenge. One respondent noted that the primary problem is that the pool of qualified line workers is shrinking: "Part of the problem is that line workers are in such high demand, they tend to be very mobile, and they have the ability to go to different jobs a lot depending on wages, working conditions, and other incentives. They're golden, but the pool's getting smaller all around." Technicians, who comprise several related job types, were the second most frequently identified occupation associated with hiring challenges. Electricians with high voltage experience were identified as difficult to recruit and hire by several employers. Only a few respondents noted specific challenges for operators or for mechanics.

Table 8

Specific Hiring Challenges
Rank-Ordered by Occupation

Rank	Occupation	Specific Hiring Challenges
1	Line Worker	• Most severe shortages reported • Sellers' market • Largest occupational group
2	Instrument/Control/ Relay/Meter Technician	• Highly specialized work and skill requirements • Lengthy training required
3	Electrician	• Electricians with high voltage experience and substation electricians (aka Wiremen)
4	Operator	• Substation Operators
5	Mechanic	• Few noted; some difficulty finding cross-trained mechanics with skills in other crafts

Other Concerns: Engineers

This study focused specifically on craft occupations and did not include an examination of the engineering workforce. However, a number of employers shared concerns about their ability to attract, hire and retain qualified engineers in the future. One respondent recalled that shortages of utility engineers became more noticeable in the mid-1990s. He added that while his organization has managed to fill most engineering openings, he anticipates that recruiting will become more difficult in the future. He noted: "Fewer college programs are training in utility-based systems, and energy is not a glamorous industry. Students just don't get into it. Ten or fifteen years ago we literally had a glut of utility engineers, then we had consolidations in the industry, and that led a lot of students to look elsewhere."

One large employer reported that nearly a third of their workforce consists of engineers and engineering technicians. For them, finding electrical engineers with training and experience in power systems has become increasingly difficult. The shortage of qualified engineers, combined with their internal retirement projections, has prompted his organization to over-staff in some trainee positions. He noted: "Ideally we'd like to see more EEs with five years of power experience, so they're up to speed when they come in, but there's a big gap at that level. We're starting to overstaff with junior engineers so they're trained up and ready to replace our current staff when they retire, so we don't always have to play catch-up."

Another employer noted that they plan to continue to automate more of their engineering systems, such as metering, which may significantly reduce their long-term need for craft-level meter technicians. Other respondents intend to increase their use of technology tools such as computerized control systems and even Geographic Information Systems (GIS). As they do, some employers say they will be looking to hire additional engineering technicians, computer-assisted drafting/design (CAD) specialists and others with computer and information technology skills. As the level and use of technology increases, some employers say they will be looking to employ workers who have more knowledge and training in the use of advanced technologies.

Workforce and Succession Planning

One set of interview questions inquired whether employers had formal, written workforce succession plans in place to help guide strategic decision-making about human resources policies and practices. The analysis showed that while all organizations engage in some sort of workforce or succession planning, there is a high degree of variation among employers about what they choose to focus on, and the extent to which they have invested in workforce planning as a part of a broader organizational strategy.

Overall, the results suggest that only a few employers have a formal plan or planning processes in place that they use on a regular basis to analyze, project and plan for future employment requirements in craft occupations. Many respondents said they did recognize the

importance of having a formal workforce planning process, and that recent hiring challenges have caused their executive managers to make workforce assessments and planning a higher priority. But most employers—even those who are actively engaged in workforce succession planning—noted that there are many challenges to developing and implementing formal plans.

Internal/External Drivers

Among the few organizations that do use a comprehensive planning strategy, some are driven (at least in part) by externally-imposed rules, policies or laws that require them to conduct workforce risk assessments and establish action plans based on those assessments. While no respondents said they believed that externally-imposed requirements were the primary impetus for their structured planning, they generally agreed that being held accountable for this work helped push them to develop a comprehensive planning process. For others, external pressure came in the form of an increasing number of national studies, media reports and concerns by industry groups about looming labor shortages due to retirements and the weak pipeline of new workers. Some respondents noted that this kind of high-profile attention heightened awareness among industry leaders about workforce shortages and has compelled executives to make human resource planning a key internal issue and part of their organizational strategy for improving competitiveness.

Bigelow Canyon sunrise

Photo courtesy of Portland General Electric

Informal Approach

Although a few companies reported that they employ a deliberate, systematic approach to workforce planning, this was not typical of most employers. One employer described it as an informal approach: "It's a lot of guesswork, it's not very scientific, and we use what we have." Some employers use a wide variety of internal data and indicators to forecast critical job losses due to retirements or to identify strategies for recruiting and retaining workers. Employers who do conduct these analyses rely on information that is readily available (but that can take time and effort to organize), such as past retirement patterns and eligibility dates, turnover and vacancy rates, compensation, and breakouts of employees in each job class. For many employers, however, this planning process is conducted under conditions in which limited resources, time and competing priorities prevents them from using a more formal approach. Indeed, many employers noted that their efforts are often done on a piecemeal, "as-possible" basis, and that the results are often not well integrated. One respondent noted: "We do some workforce planning, but it's pretty departmentalized, not company-wide. Part of it is the culture of our business. We just haven't done it. We have emergency plans, and we know who our key personnel are, even at some of the technical levels, but we don't have an organized plan."

PUD employees take a maintenance walk through the juvenile fish bypass at Rocky Reach Dam

Photo courtesy of Chelan County PUD

Management-Focused

For most employers, efforts to initiate workforce and succession plans started at the highest levels of the company, with executive and mid-level management as the primary focus. Relatively few employers reported that similar planning efforts have filtered down into the lower levels of the organization. In some cases the emphasis on top and mid-level management came in response to analyses revealing that a large number of executives were already eligible for retirement. One employer noted:

> Our organization has not focused on workforce planning or succession in the past. This is new stuff. And, we headed down the planning road due to impending retirements at the upper levels. Around 75 percent of upper management will be eligible to retire in the next five years, so that's where we're focusing. We plan to move that down into other levels of the organization in the coming years.

For many organizations, however, workforce planning for craft occupations has come more slowly. Although several respondents said they are focusing specifically on craft jobs they've identified as 'critical' to their operations, these efforts are often uneven and in reaction to current, critical shortages rather than future projections. While there is a growing awareness of the need to look at all levels for workforce planning, some organizations have been slow to act: "I hope we get to it sooner rather than later. We need to build a bridge between hourly and supervisory and upper management. I don't know if it will become a priority or not this year. We need to do it."

A New Commitment

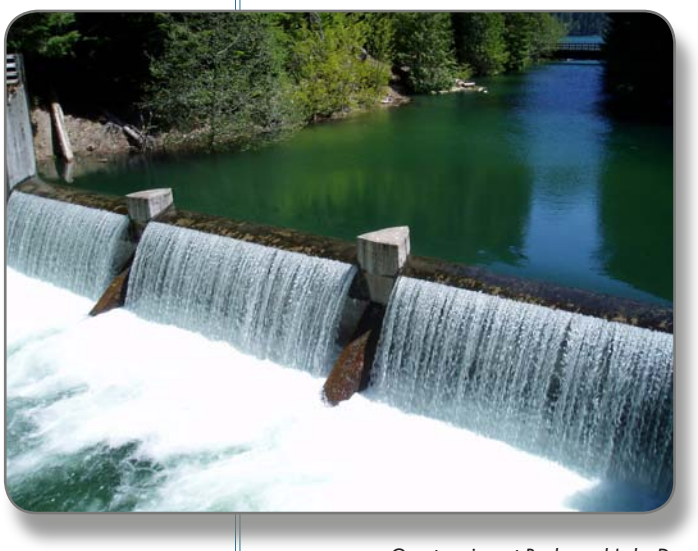
While many respondents were candid that their organization has not taken a comprehensive approach to workforce and succession planning, several reported that their executive management has become acutely aware of the shortages and impending retirements and recognize the need for a more systematic approach. These respondents reported that they now have a higher level of commitment to workforce planning than in the past. One large employer described how

> *A number of employers shared concerns about their ability to attract, hire and retain qualified engineers in the future.*

this new commitment unfolded:

> We don't have a workforce plan in place. We've created a workforce analyst position to begin work on that. Two years ago we did a major demographic study of our workforce, compared it to national demographics. We found that we're a little older, even though we retire folks a little later. We have good data points for retirement. Now we're looking at the whole organization at once. A staffing and development plan is underway, it's based on data from each supervisor. We're aiming at 2008 to complete a formal study. We want to know what kind of workforce risks we have.

For organizations that have been engaged in comprehensive workforce and succession planning, top-level commitment has been instrumental to their progress. For them, part of what convinced executive management to make workforce planning a higher priority was based on internal analyses of their own workforce composition, recognition that shortages in key positions were already occurring and that the external labor market is shrinking. One employer described how the results of one study they conducted helped make the long-term risks more evident to management: "One listing showed us that we waited too late, because many of those folks have already retired. We've identified replacements, but they don't yet have the skill sets they need." One human resources (HR) manager underscored the value of having data-driven results to get the attention of company executives: "Top management tends to be reactive, they focus on the day-to-day, but when you put this kind of data in front of them, it makes it real." This manager noted that it took time—and much discussion—before top management got behind the need for a comprehensive planning process:



Overtopping at Packwood Lake Dam

Photo courtesy of Energy Northwest

> Our workforce planning process is not new, but with the competitive market we're in, management recognized that we need to step up our

development of employees and bring in new hires. Two thirds of our workforce is hourly, so it's a big deal. Back in 2000 we did much the same analysis, and we realized we needed to do something, we knew we had a problem. We look around the room now and it seems like everyone is over 50, and many are within five years of retiring. Before, we didn't worry about it, but now we *have* to pay attention. The difference is that leadership has said this is important and we need to treat this as important. The culture has changed, and now it's not just an HR problem, it's recognized as a shared problem, and the workforce management plan is not just a HR document.

Priorities and Resources for Planning

For organizations that have not yet engaged in a formal planning process, there was often a perception that top management is not convinced about the need for a more deliberate approach. Some HR managers noted that the "lukewarm" attitude of some executives has meant that little additional resource is devoted to jump-starting or enhancing their planning process. Other respondents said that their organization already operates under strict budget constraints, and management is reluctant to increase spending for additional staff or time for planning. Whatever the reasons, a weak commitment at the top and lack of resources leave some HR staffs feeling overwhelmed and ineffective:

> It's [a formal workforce plan] something that comes up on occasion, leadership talks about it. But we've got people who are just very busy. That's not a good excuse, but it's the truth. We probably need to begin something like that but we have not done anything yet. If it was an easy thing to do I think we'd get it started, but it could turn into a big hairy monster to do. Now we rely on department managers to tell us what they think they'll need, and it's part of their budget formation. It's the foggy crystal ball approach. We try to anticipate who and how many will retire, but we don't really know until they [employees] tell us.

Effective Models for Workforce Planning

Employers who have developed specific plans and strategies for workforce succession say that their biggest successes have come through actively engaging supervisors and managers for their support. This has meant "selling" management on the benefits of work-

> ***Some employers use a wide variety of internal data and indicators to forecast critical job losses due to retirements, or to identify strategies for recruiting and retaining workers.***

force planning for their departments, identifying feasible solutions and action steps, and working to ensure that the plan gets implemented. As described earlier, companies who have managed to dedicate staff time and additional resources to the task of planning have managed to sustain and even expand their efforts. In general, large organizations were more likely than smaller companies to secure management support and resources to support planning.

"For organizations that have been engaged in comprehensive workforce and succession planning, top-level commitment has been instrumental to their progress."

Internal Analysis: Careful analyses of internal human resources and financial data were common first steps among companies with formal planning processes. One HR manager described how they issue detailed reports to management that include a red-yellow-green coding scheme that identifies critical jobs, current employees, and what skills the company will lose when they retire: "Every other year we do a full analysis, a template of actions, definitions of jobs, it's owned by our group, and it's a dialogue with management."

At this company forecasts were produced based on 3, 5 and 10-year scenarios and included graphs, indicators that may increase the likelihood of early retirements, and spreadsheets that identify every employee sorted by the date of retirement eligibility. He elaborated: "For several years we've used data to support planning, predicting retirements, we looked at early and full retirement scenarios. We give the data to managers, and we work with them to identify the critical jobs, the 'hot spots' that are hard to fill or take a long time to train up, where we might anticipate turnover. Then, we use that to make plans to address the problem." He added: "It's not just the crafts, we've extended it company-wide. We're using data to plan for succession, for recruiting, and we're building in overlap between some jobs so we can mentor and train new employees."

Looking Outside: A different employer described their detailed approach to workforce planning and risk assessment, which they've developed over the past 10 years. Over time, their multi-year planning process has become broader and more sophisticated, and they continue to learn new ways to assess risk and use the results for decisions about recruiting and employee development:

> We start with an external scan of the labor market, then an internal scan of our internal business strategy, so they're aligned. From all that

> we develop a list of the most critical occupations we need to worry about and plan for, like projected turnover rates due to retirements. We know that's an industry-wide issue, and we're thinking about that because it's big here too. We're doing some much deeper analyses on those occupations now, to determine what's required for those positions, whether we can develop internally or have to go outside.

Line School Instructors

Photo courtesy of Avista

This respondent described how the staff also uses the information to develop "treatment plans" for individual jobs aimed at reducing the risk of incurring skill gaps due to turnover, retirements or promotions. Once the solutions are developed they are proposed to upper management, who considers the merits and costs of the proposal and then renders a decision on the plan. Once approved, the treatments are implemented and results are reported on a quarterly basis to determine progress and needed changes.

Implementing the Plan

Even for large organizations that are able to devote significant staff time and resources to support workforce and succession planning, there is no guarantee that their workforce plans will be implemented effectively. One respondent noted: "Saying succession planning is nice, but doing it is problematic. How we'll transfer that knowledge to other workers, what the strategy is, and how to implement, it takes resources, time and commitment, and while we're doing all that, we still have to continue our regular work." Another respondent noted that while her company's comprehensive planning process included the collection of data from many different departments, the fine-grained results were not fed back to individual business units for them to use. The result was a high-level analysis that provided the big picture for the organization, but didn't give department managers what they needed for workforce planning. She added:

> The plan doesn't pinpoint real problems, like the fact that the whole workforce at [Dam] could retire at the same time. To me it doesn't have sufficient levels of detail. I worked on that plan, I submitted all the detailed data, we all submitted this stuff, but the plan doesn't reflect that. To me the plan could be very beneficial and helpful for workforce planning, but it's not. It gives an overall forecast, it looked at a few critical positions, but it's an organization-wide look, not looking at regional or department needs or projections. It needs to include details we can use here on the ground.

Two-Year College Connections

Interestingly, while some employers reported that they have built connections with regional community and technical colleges, those partnerships appear to be limited in number and scope. There were relatively few instances in which respondents reported an ongoing relationship with an individual college, and those who did often described their efforts to expand employee recruitment activities rather than to foster specific training programs for new or incumbent craft workers. Typically, employers had "visited" several colleges and had discussions about courses or programs, but few said they had worked directly with staff to develop specific training programs. One employer described it this way: "We've made some visits to several colleges, Centralia College, Spokane Community College, Wenatchee Valley College, Perry Technical Institute. They cover our geographical area, but we have no formal partnership with any of them for these jobs."

Control Panel

Photo courtesy of Bonneville Power Administration

Apprenticeship is the most common training program connection between these employers and colleges, and there are notable examples of joint training centers connected with college campuses that serve

the industry; some ongoing relationships support degree and certificate programs serving apprentices and journeymen for the industry. But overall, relationships between employers and regional colleges around new and incumbent worker training appear to be limited. Employers' emphasis on recruiting and hiring may account for the limited connection regarding training content; the interviews also did not include many training coordinators who may be more familiar with specific programs.

Internal Training Typical

One reason for the apparent lack of formal partnerships with colleges is that many employers are in the business of developing and conducting training for craft workers themselves. Sometimes this happens through formal apprenticeship programs under agreements with their labor unions, and with local colleges. But typically craft training, especially for current workers, is company-sponsored and is specifically tailored to certain departments and employees. One manager noted: "Currently we don't do any of our training at local colleges. All of our training is customized and done through in-house classes and instructors. We just don't have relationships with local colleges for these positions. It would make good sense for us to reach out, but we haven't done that yet." While some employers use their own in-house training staffs, other employers use equipment vendors to deliver training that is specific to new equipment or upgrades they've installed. Some employers indicated that this approach is often more convenient for them than going through many colleges, as the training is usually short-term, and specific to the technology employees use on the job.

Some employers have developed creative arrangements with colleges and other employers around craft training. A few have found ways to leverage and share their in-house training capacity between organizations, in effect "selling" training services to other employers. One small employer described an apprenticeship program for electricians and meter technicians for which they paid a large utility to teach specific training classes at a regional college campus. As part of the agreement, the college provided facilities, equipment, and delivered

> *Employers who have developed specific plans and strategies for workforce succession say that their biggest successes have come through actively engaging supervisors and managers for their support.*

"related supplemental instruction" required under the state-registered apprenticeship program. Other unique arrangements include agreements between employers and colleges for the use of specific equipment and lab facilities that are either unavailable or more current than what is available through the college.

For the most part, however, employers reported that currently their reliance on local community and technical colleges to provide craft training is modest and probably underdeveloped. The more innovative arrangements described by a few employers do not appear to be very common.

McNary Substation in Umatilla Oregon

Photo courtesy of Bonneville Power Administration

Reaching Out to Colleges

There is some evidence that the connections between colleges and the industry have become stronger in recent years. Several employers noted that they are having more contact with local colleges through their participation in college-sponsored advisory committees, industry skill panels and industry-education conferences. Employers reported that they are beginning to work more closely with local colleges to explore ways to expand their training options for craft employees.

Respondents noted that a key reason for expanding their college connections is that qualified workers are getting harder to find, and that college programs offer one way to tap into new workers and to help upgrade the skills of current employees who will be expected to fill the gaps created by retirees. One employer described how two-year colleges can be part of the solution:

> The market's getting tighter, so we need to reach out to identify the feed stock for the industry. Over the last 10-15 years we could find talent out on the streets, but that's not the case anymore. We've got to build partnerships to grow our training capacity. And, we like the idea

> of local college connections, training local people. Locals tend to stick around.

But employers' views about the role of two-year colleges for craft occupations appear mixed. On the one hand, some employers indicated that while they like the broad qualifications that would come with a two-year degree or certificate in energy technology, most craft jobs do not currently require them (See Appendix A). Others noted that simply expanding existing apprenticeship programs may provide a more focused way to build the pipeline of new workers. On the other hand, some employers do not expect two-year colleges to provide all the technical training their employees will need. For them, programs that provide a broad foundation in energy technology are also important. Taking this idea a step further was one employer, who described how building a common foundation could also help develop a talent pool in related industry sectors that energy employers could draw from in the future:

> To the degree that the community and technical colleges can cut across different industry sectors like energy, pulp and paper, manufacturing, they can give students a good foundation and the basic skills. We can build on that with technical skills. We're willing to invest more in that approach, give them job experiences or internships. We'd like to be able to guarantee employment too, but of course we'd like the cream of the crop. We'd like to be part of the selection process.

While some employers reported that they have built connections with regional community and technical colleges, those partnerships appear to be limited in number and scope.

Apprenticeship

One long-standing method these companies have used to train workers for these positions is through apprenticeship. Indeed, most of the companies reported having some type of formal apprenticeship program in place for one or more of the occupations. Typically, these programs are a joint partnership between the company and their labor unions, and are managed by a Joint Apprenticeship Training Council (JATC) that operates under a state council that oversees all apprenticeship programs. Many community and technical colleges are apprenticeship partners. Formal apprenticeships are registered with the state and are required to meet various selection, curriculum and operational standards. Employers that operate formal apprenticeship programs typically follow a similar recruitment and selection

process, which usually includes analysis of past academic preparation and skills tests. Some companies require completion of specific courses, such as math or basic electricity, or experience in a specific field of study. In Washington, apprenticeship has generated positive economic benefits for workers and the state.[32]

Apprenticeship positions are competitive, and there are typically a limited number of trainee slots per year. Apprenticeships require academic learning through related classroom instruction (at least 144 hours per year) and a lengthy applied training component, with paid on-the-job training comprising the majority of the program. Depending on the occupation, energy-related apprenticeships typically last for 3-5 years and comprise several thousand hours of on-the-job experience. Each apprentice must be supervised by journey-level employees. This expert-student relationship is a key component of the apprenticeship training model, however it requires considerable time and effort from journey-level mentors and limits the number of apprenticeship slots an employer can support.

"There is some evidence that the connections between colleges and the industry have become stronger in recent years."

A Big Investment

Several employers noted that because of the high costs associated with apprenticeship, they are very careful to select candidates who will complete their program, hoping they will stay on at the company afterward. A respondent from one large employer reported that they have an average of 400 apprenticeship applicants every year. She described their program in this way:

> For an apprentice, it's a three year program, a half-million dollar investment. So we're serious about making sure they'll succeed. We test them, look at eye-hand coordination, high school math, English, and see if they can follow directions. They have to pass the tests at 70 percent or higher. We look at their individual scores, evaluate the quality of their past experience. We pick the best candidates, and then they interview with our craft committees. In the end we pick just a few. Last year for operators, we had six openings, but we did 60 interviews. It's a big process.

Employers' current investments in apprenticeship are substantial. Table 9 shows that a total of 349 apprentices at various stages in their pro-

grams were employed at all but two of the 12 companies included in the survey. For these employers, apprentices account for more than 10 percent of the total workforce in these occupations. The table also shows that the largest total number of apprentices is for line worker, with 135 apprentices working at eight of the 12 companies. On a percentage basis, however, electrician apprentices are a proportionately larger group, accounting for nearly 15 percent of all electricians across nine companies.

Table 9

Apprentices as a Percentage of Full Time Employment (FTE) by Occupational Group

Occupational Group	Number of Employers with Apprentices	Total Apprentice FTEs	Apprentices as a Percent of Total Workforce
Operator	4	37	6.1%
Mechanic	2	16	3.7%
Electrician	9	98	14.8%
Instrument/Control/Relay/Meter Technician	9	60	10.6%
Line Worker	8	135	12.5%
Total	10	349	10.3%

The table also shows that only two companies reported that they have mechanic apprentices, and these apprentices comprise less than four percent of their total mechanic workforce. This is interesting because mechanics are employed by all but one company (see Table 4), and eleven of these employers anticipate losing nearly 31 percent (133) of their mechanic workforce to retirements over the next five years (see Table 6). This suggests that these employers are either planning to replace mechanics through outside hiring rather than with apprentice mechanics, or that they plan to use alternatives to apprenticeship to replace mechanics who retire. A similar observation was made for

operators, however retirement projections for this group are about half that for mechanics. Also, more companies (4) report they currently employ operator apprentices, and the total number is more than twice that than for mechanics.

Restoring Capacity

Several employers noted that while their apprenticeship programs have been in place for many years, industry consolidations and streamlining during the 1990s—which temporarily increased the availability of qualified workers on the open market—led them to cut back on the number of apprenticeships they supported. Some employers said that for a time they stopped sponsoring craft apprenticeships entirely. But a number of employers reported that they are now looking to expand apprenticeship programs in order to reduce the skill gaps that will occur when craft employees retire. One respondent emphasized that her company is intent on keeping the apprentices they sponsor: "We need to spend the money to get them through an apprenticeship, but we also need to look at retention. We can't keep stealing from each other."

A number of employers reported that they are now looking to expand apprenticeship programs in order to reduce the skill gaps that will occur when craft employees retire.

Some employers expressed a concern that they have not moved quickly enough to expand apprenticeship capacity. A comparison between current apprentices and 2006 apprentice enrollments suggests that this concern may be warranted (see Figure 9).

Figure 9

Apprentices (all levels) and 2006 Apprenticeship Enrollments

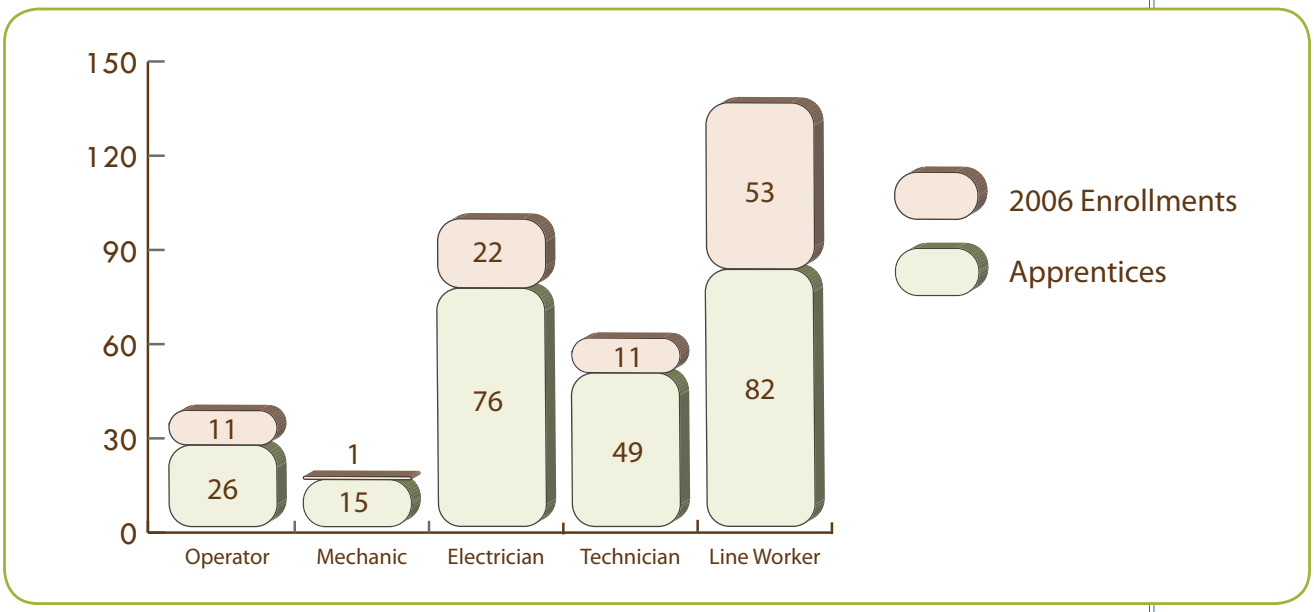


Figure 9 shows that in 2006 the largest number of new apprentice enrollees was for line workers (53). Line workers also comprised the largest proportion of new apprentices (65 percent), followed by operators (42 percent), electricians (29 percent), technicians (22 percent), and mechanics (6 percent). Enrollments in 2006 accounted for about 39 percent of all apprentices for the 10 companies who sponsor them.

Perhaps the most striking finding is for mechanics: As described earlier, the proportion of apprentices to journey employees is smallest for mechanics when compared to all other craft occupations (see Table 9). But Figure 9 shows that mechanics also had the smallest proportion of new enrollments, with just one new apprentice enrolled in 2006.

It should be noted that these comparisons are limited as they only account for enrollments over one year, and apprenticeships typically take 3-5 years or longer to complete (see Appendix A). The data also do not reflect past or more recent enrollment trends. But

the data do raise some questions about apprenticeship capacity and the supply of new workers. For instance, in Washington State, a yearly average of about 71 registered line worker apprentices completed their programs between 1998 and 2005; the data shows a gradual decline in completions over time.[33] While the additional data required for a more detailed analysis of apprentice supply and demand is beyond the scope of this study, the results raise questions about apprenticeship capacity and its relationship to future employment demand due to retirements.

System Control Map

Photo courtesy of Grays Harbor PUD

Pre-Apprenticeship and Other Training Options

As mentioned earlier, it is not clear why the number of mechanic apprentices or enrollment slots is so much lower than for the other occupational groups. One possible explanation is that employers are using other options to prepare mechanics, including alternatives to formal apprenticeship. In fact, eight of the 12 employers reported that they routinely hire new employees into a trainee-level position that is preparatory to various craft occupations. For instance, several respondents described how they've hired several new employees as a "helper" or "ground man" to support the work of regular line workers. Other companies reported hiring new employees as electrical helpers, or as operator trainees. In most cases respondents described the primary goal of these positions as serving as a training ground for future apprenticeship applicants or for other jobs in their companies.

It should be noted that with a few exceptions the number of trainees hired is relatively small. One large employer reported that they currently have 10 employees in various trainee positions in one or more of the five craft areas; another large employer said they have 14 wiremen helpers and several technician helpers; one organization said it annually provides pre-apprenticeship training to around 70 students as helpers in various craft occupations, most of whom then enter regular apprenticeship programs at other companies. But most employers reported employing small numbers of craft trainees. In some instances, employers said they are deliberately targeting recent high school graduates through various student outreach programs at area high schools. Some employers described how these trainee positions have enabled them to target students in remote communities. One respondent described the logic behind this strategy: "One reason we need to have this program is we can recruit someone locally, train them at the remote site, put them to work and they're more likely to stay and not quit, because they live there and they know what it's like to live and work in a remote area."

Trainee hiring programs are sometimes coordinated with existing apprenticeships, since they are frequently viewed as 'feeder' programs to create a pool of new applicants. One employer described how they have started recruiting for apprentices and helper applicants at the same time, using most of the same selection criteria and testing as for regular apprenticeship applicants. This has helped to streamline the process, and align skill expectations and training goals. In most instances, however, employers did not describe their efforts to hire trainees as part of a formal "pre-apprenticeship" program. Several employers said these positions are purposely separated from their apprenticeship programs because of objections by their labor unions. One employer noted: "We continue to struggle with our blue collar union, they're very protective of their program, they don't really want pre-apprenticeship programs here. We're continuing to push on this but not having a lot of success." Other respondents said they have successfully negotiated with their unions to support the hiring of unskilled trainees. According to some employers, unions also see value in bringing in trainees because it provides another way to grow their apprenticeship applicant pool and for trainees to build new skill sets.

These positions also give trainees and the company a chance to determine if entering into an apprenticeship is likely to be a good fit.

Building a K-12 Pipeline

All employers expressed their concern that the future supply of new workers will continue to shrink, and that too few high school students are taking the kinds of courses and programs needed for developing the skills desired for employment at their companies. All employers reported that they regularly reach out to K-12 schools and students in their areas, and many do so in myriad and often creative ways. At the same time, however, most admit that they are not doing all they should to build a talent pipeline for the future.

Port Westward Generating Plant

Photo courtesy of Portland General Electric

Respondents described many ways that their outreach has changed over the years, and many are trying to take a more focused approach, whether due to limited budgets and staff, or because they feel a new sense of urgency to attract more youth to energy careers. All employers noted that they face many challenges to building an effective K-12 pipeline for the future.

Becoming More Strategic

Many respondents reported that their organizations used to do much more K-12 outreach in the past than they do currently. A number of employers noted that past industry consolidations and other cost-cutting initiatives led them to trim HR staffs and re-focus their limited budgets on filling immediate hiring needs. Many employers said they

now have less time and resources to devote to general student outreach, for instance by attending career fairs, visiting high schools, and providing career information directly to students. Employers report that they have become much more focused and strategic in how they do outreach, and they are interested in strategies that will help them meet specific recruiting goals.

Greater emphasis on meeting recruiting goals also occurred because most student outreach programs did not produce short-term results. Several employers reported that in many cases reaching out to students and sponsoring special programs were not generating many new hires for them. One large employer noted: "We did a review and found that most of the K-12 stuff we were doing was not producing any real results for us. Over the past several years we spent $250,000 plus, and that's not counting staff time." This employer described how they worked to develop a program whereby high school juniors and seniors were given a summer stipend to work in electrical trades-related positions. The program generated a lot of interest and support from schools and parents, but they found it was not cost-effective for the employer. He noted:

> After two summers of offering the program, we found we weren't getting any of these students later as employees. Over the last four years we've had over 50 high school students participate, but so far only one has actually been hired following the program. We're trying to take the program one step further. Now it's not just about outreach, it's about developing new hires.

A number of employers reported that they were able to maintain and even expand their outreach efforts over the past few years. But even with adequate resources, these employers are also intent on being more strategic, and more selective. For instance, some employers are tailoring their high school outreach to women and ethnic minorities in order to help them meet recruiting goals for those populations. Other employers are participating in fewer career events, and those they do attend are often larger, or target certain types of students. Many employers are targeting individual schools that emphasize technical programs. One employer described her approach: "We're focusing on area high schools that have a pre-engineering focus or that offer specific technical programs. We're trying to be more strategic."

"Trainee hiring programs are sometimes coordinated with existing apprenticeships, since they are frequently viewed as 'feeder' programs to create a pool of new applicants."

Employers noted that they face many challenges to building an effective K-12 pipeline for the future.

Respondents indicated that human resources staffs are sometimes forced to allocate their time based on short-term priorities, such as filling immediate recruiting and hiring needs. While competing priorities are present in any job, it presents a unique problem for some human resources managers and their staffs. Short-term demands can sometimes cut into staff time and resources that were originally allocated for outreach to the kinds of high school and college students that these employers hope will pursue careers in their companies. As one respondent noted, this sets up a paradox: "We are really having to limit how much time we spend, we're doing lots more recruiting and hiring, and we have limited time and staff. We don't have time to do the outreach. It's a conflict."

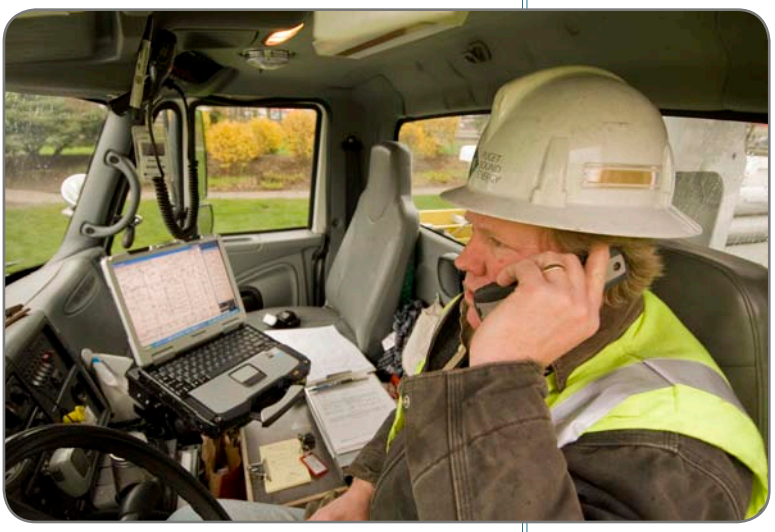
An Image Problem

Underlying many respondent comments is the concern that the energy industry—and especially energy craft jobs—suffer from a negative image. Like many other industrial jobs, energy craft jobs are often viewed as dangerous, dirty, and physically demanding. As one employer noted, it can be difficult to attract students to craft jobs when they are being conditioned by teachers and counselors to pursue four-year degrees and white-collar careers. He added: "It's not a sexy field to be in, we should do more, we need to have more speakers to talk about career opportunities, not about university degrees, but technical degrees, getting the word out during career days at junior high and high school. We need to send the message that it's OK to do those jobs, they're good paying, stable."

Several employers noted that fewer students are pursuing degrees in power engineering, in part because fewer of these specialized programs exist, but also because there is bigger emphasis by teachers and school counselors on software development and computer engineering. One employer stressed his belief that the industry needs to turn around the public's perception about energy careers: "What we need in the Northwest is, we need a huge, pervasive marketing campaign, geared to students, parents, teachers and counselors. We need to pool together and get the word out, get rid of this blue-collar stigma. Teachers and counselors are rewarded for pushing four-year

colleges. That's got to change."

Another employer pointed out, however, that in addition to the bias for university degrees, industry consolidations and reductions in apprenticeship programs have meant fewer training options are available for those high school graduates who are interested in energy craft jobs: "We see the need to reach out, but we really don't have a shortage of high school kids, it's that they're being steered into four-year college programs. But, there's little knowledge about apprenticeship. On the other hand, over the last decade we haven't *had* many apprenticeships."



Mobile Workstation

Photo courtesy of Puget Sound Energy

Skills and Knowledge Count

Employers were quick to point out that while it's true that most craft jobs do not require a college degree, they still place a premium on applicants who have solid basic skills, especially in math and science. And, many craft jobs have become more complex, requiring broader knowledge of problem solving techniques, teamwork, and use of computers and technology. "It's not OK to just get by with a 2.0 GPA," said one employer. "We pay for skills, and we look for those qualities." Other employers expressed concerns about an apparent lack of "work ethic" exhibited by new applicants, especially those who are younger. But many employers are concerned that with a shrinking labor pool and fewer students taking challenging high school courses, the qualifications among students who pursue craft jobs in the future will decline, making it even harder to hire skilled craft workers. One respondent noted:

> We're concerned about the future workforce. We know the labor pool is shrinking, and we know that students are taking less math and science. It's a problem. And it's an attitude. Students who have too many choices often take the easy way out, and often that means the easy coursework, with too little math and science. But it affects them later in life. Even in apprenticeships, we still need kids who are prepared with the basics. We can't start them over with basic math, there's too much to learn.

Many respondents described how they are working with high schools and student groups to emphasize the importance of solid math and science skills for electric-sector craft jobs. A number of employers sponsor special programs and scholarships to students as an incentive to take higher levels of math and science. Some employers offer work-based learning and job-shadowing experiences for high school students, where they are paired with journey craft employees, but without performing hazardous work.

Diablo Canyon Dam Spillway

Photo courtesy of Seattle City Light

Exposure to the work environment provides a reality check for students, and helps show how the courses they take in high school relate to the job. Many respondents noted that the most effective approaches put students in direct contact with skilled craft workers: "It's best if the employee tells their own story, what it's like being a lineman or operator, or wireman. That way it's real to the kids, they respect that and they listen to them, it makes a big difference. I couldn't go and talk to students about those jobs with the same kind of authority."

CONCLUSIONS & IMPLICATIONS

The primary purpose of this study was to understand the employment and training needs of electric-sector employers in the Pacific Northwest region. The study focused on five occupational groups that comprise the largest number of craft jobs among electric-sector employers in Washington and Oregon: operators, mechanics, electricians, technicians, and line workers. The results of this study identify several important themes and implications that merit discussion among industry, education, economic development and workforce service providers. Some of the findings also have policy implications for state and local governments.

Conclusions

Labor Shortages Imminent

A growing body of research and industry reports suggests that the energy industry in the U.S. will see an exodus of highly-skilled craft workers over the next five to ten years, due primarily to retirements. Downsizing during the 1980s and 1990s and demographic shifts will contribute to a shortage of working-age adults, as Baby Boomers leave the workforce in record numbers. Nationally, up to 50 percent of all electric utility workers are forecast to retire within the next decade. There are general concerns among electric-sector employers about where new workers will come from, and whether industry and educational institutions will have adequate capacity to train the future workforce.

The findings of the current study suggest that many of the same conditions, concerns and challenges facing electric-sector employers nationally are also true for employers in the Pacific Northwest. The 12 employers who participated in the study employ 3,349 workers across the five occupational groups. Only five employers plan to do any new hiring in these occupations over the next three years, and

their forecast of 80 new hires will add just 2.4 percent to their current employment base; line workers will account for about 70 percent of all new hiring.

In the meantime, employers reported that they are currently trying to fill a number of job openings. At the time of the interviews, employers reported that they had a total of 276 job vacancies across the five craft occupations, with technicians comprising around 38 percent of current openings.

Although these employers do not anticipate much new hiring in the next few years, they do predict that they will experience a substantial loss of skilled craft workers to retirements: Employers anticipate losing 800 craft workers to retirements over the next five years, which represents nearly 24 percent of their current workforce. At the same time, all employers reported they intend to find replacements for every employee they lose to retirements.

"Many employers are concerned that with a shrinking labor pool and fewer students taking challenging high school courses, the qualifications among students who pursue craft jobs in the future will decline, making it even harder to hire skilled craft workers."

It is important to note that the data showing that new hiring will remain essentially flat do not include current job vacancies, forecasts for retirements or retirement replacements. This is significant because it suggests that while employers' growth estimates for new hires are tepid, current vacancies and anticipated employment demand due to retirements is substantial.

Recruiting and Hiring Challenges Increasing

Just as competition for skilled craft workers is increasing, employers report that it has become harder to recruit, hire and retain qualified employees. General challenges and concerns cited by all or most employers include:

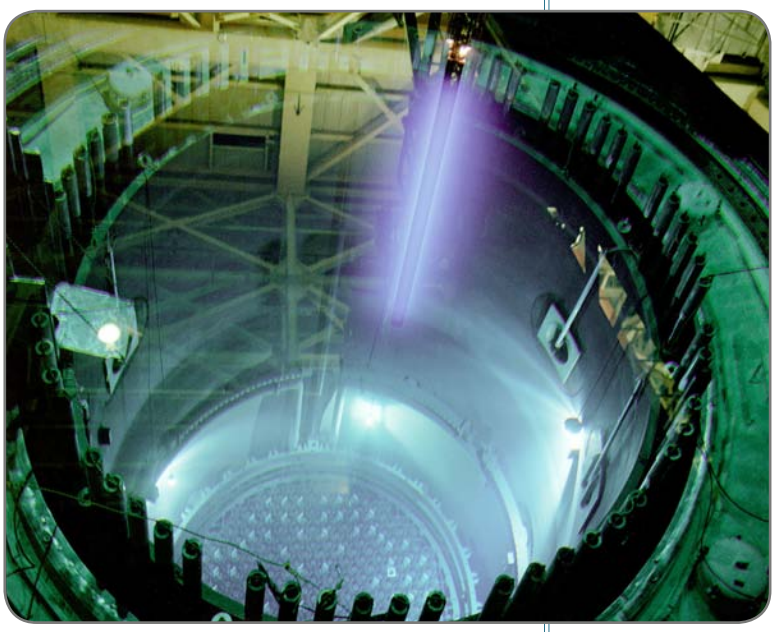
- **A shortage of qualified applicants**: Nearly all employers reported that the pool of qualified applicants is shrinking, especially at the journey-level. 'Poaching' employees from other companies has become more difficult and less productive.

- **Shortages cut across industry sectors**: Declines in other industry sectors, such as manufacturing, have reduced the availability of workers from related industries.

- **Increased recruiting and hiring costs:** The amount of time, effort and costs for recruiting and hiring has increased over the last few years due to a tighter labor market.

- **Filling the skills gap:** The tighter labor market has led some employers to resort to greater use of overtime pay. Subcontractors continue to fill some gaps, but this can be costly and can limit an employer's control over some functions.

- **Adjusting expectations:** Some employers have moderated their expectations, accepting less-qualified applicants and streamlining their selection process to meet hiring goals.



Nuclear fuel rod movement at Columbia Generating Station

Photo courtesy of Energy Northwest

- **Work conditions matter:** In addition to the physical demands, inclement weather, safety and emergency situations required of most craft jobs, geographical factors also present hiring challenges. Urban settings often include large jobs and congested work, while remote assignments can require extensive travel and a rural lifestyle with limited amenities.

- **Diversity lacking:** The general shortage of qualified applicants has meant that recruiting and hiring qualified women and ethnic minorities has become even more difficult and competitive, and remote work sites and conditions pose special challenges.

Specific hiring challenges are most pronounced for line workers, which comprises the largest single group of craft workers; the supply

of qualified line workers is tight and it's a "seller's market." Technicians and electricians were identified as challenging due to the specialized nature of the work and specific skill requirements.

Engineering workforce: Qualified engineers are becoming harder to find, and there are relatively few university engineering programs that specialize in power systems. Continued automation and new technologies are likely to increase industry's reliance on computerized control systems and tools, which may increase hiring demand and expand the skill sets required of engineers and technicians.

"Employers anticipate losing 800 craft workers to retirements over the next five years, which represents nearly 24 percent of their current workforce."

Workforce Succession Planning

Overall, the results suggest that few employers have formalized processes in place that they use regularly to analyze, forecast and plan for future employment requirements in craft occupations. Many respondents said they recognize the importance of having a formal workforce planning process, and that hiring challenges have caused their executive managers to make workforce planning a higher priority. Respondents noted a number of challenges to establishing and maintaining a robust planning process. Key factors influencing workforce and succession planning include:

- **Internal and external drivers**: Some organizations are required to conduct workforce planning studies and develop plans for succession, which has advanced a planning process. Others are compelled by hiring difficulties and research by national and industry groups about future labor shortages.

- **Informal approaches**: Many employers use an informal planning approach in which limited resources, time and competing priorities results in a piecemeal approach that is not well integrated.

- **Management focus**: Most employers have focused on executive management as their target for succession planning. So far, relatively few organizations have extended a deliberate planning process into craft occupations.

- **A new commitment**: Executive management has become more

supportive of workforce planning for craft occupations. Data on internal retirement projections and external reports have made workforce planning a higher priority, with new resources devoted to doing the work. A weak commitment at the top leaves human resources staffs feeling overwhelmed and ineffective.

- **Effective models**: Commitment and resources for planning was more typical among large organizations than smaller employers. Effective models integrate careful analyses of internal human resources data with strategies that are meaningful and useful to management. Integration of internal data with scans of external labor markets help determine risk assessments and enable the development of concrete plans for anticipating and reducing future skill gaps.

- **Implementation challenges**: Even with dedicated resources and staff, there is no guarantee that workforce succession plans will be implemented effectively.

Setting a Pole

Photo courtesy of Snohomish County PUD

Two-Year College Connections Limited

The number and scope of formal partnerships between these employers and local community and technical colleges appear limited. Some respondents reported ongoing communications with one or more colleges regarding apprenticeship and recruitment activities, but not about the content of specific training programs for new or incumbent craft workers.

Internal training typical: Most employers are in the business of developing and conducting training for craft occupations themselves, especially for new trainees and incumbent workers. Sometimes this happens through formal apprenticeship programs, company-sponsored upgrade training, or through outside vendors.

Reaching out to colleges: Several employers noted that they are having more contact with local colleges about craft occupations through advisory committees, industry skill panels and conferences. Yet, employers' views about the role of two-year colleges appear to be mixed.

Apprenticeship and Pre-Apprenticeship Options

Most of these employers sponsor formal apprenticeship programs for one or more craft occupations through a company/union Joint Apprenticeship Training Council (JATC). A total of 349 apprentices at various stages in their programs were employed at 10 of the 12 companies, accounting for more than 10 percent of the total workforce across the five occupations. There are 135 line worker apprentices employed at eight of the 12 companies. Electrician apprentices are a proportionately larger group, accounting for nearly 15 percent of all electricians across nine companies. Only two companies employ mechanic apprentices (16).

Mossy Rock Dam

Photo courtesy of Tacoma Power

A big investment: Several employers noted that because of the high costs associated with apprenticeship, they are very careful during the selection process to choose candidates who will complete their program, and stay on at the company afterward.

Restoring capacity: Several employers noted that industry consolidations and streamlining led them to cut back on the number of apprenticeships they supported. But a number of employers reported that they are now looking to expand apprenticeship programs in order to reduce the skill gaps that will occur when craft employees retire. Some employers expressed a concern that they have not moved quickly enough to expand apprenticeship capacity.

Preparatory programs: Eight of the 12 employers reported that they routinely hire new employees into a trainee-level position that is preparatory to various craft occupations, but the numbers are small. The primary goal is to build the pool of future apprenticeship applicants or for other jobs in their companies. Most employers did not describe these programs as part of a formal pre-apprenticeship; several said these positions are distinct from their apprenticeship programs because of objections by their labor unions.

Building the K-12 Pipeline

All employers expressed concerns about the future supply of new workers, and whether they will have the skills to find employment at their companies. All employers reach out to K-12 schools and students in their areas, but most say that they did more in the past, and that they are not doing all they should to build a talent pipeline for the future.

> *"Qualified engineers are becoming harder to find, and there are relatively few university engineering programs that specialize in power systems."*

Strategic focus: Employers reported that they are much more focused and strategic in how they do outreach, and they are interested in strategies that will help them meet specific recruiting goals. Most organizations cited limited budgets and staff, and little results from past programs as among the reasons for more focus. But respondents also reported a new sense of urgency to attract more youth to energy careers.

Image problem: Respondents noted that craft jobs are often viewed as dangerous, dirty and physically demanding, and high school counselors steer students toward courses that lead to four-year degrees and white-collar jobs. This image problem is complicated by the fact that there are fewer apprenticeship opportunities for students who are interested.

Skills count: Most craft jobs do not require a college degree, but they do involve lengthy apprenticeships, and employers place a premium on applicants with solid math and science skills. Most companies emphasize the importance of basic skills as part of their student outreach, and several sponsor special programs, work-based learning experiences and scholarships that expose students to craft work and

reinforce the development of math, science and technical skills.

Implications

There are a number of implications that can be drawn from the survey data collected for this study, several of which are discussed below. These issues appear to be the most prominent and relevant to the study goals, as they integrate topics that cut across the survey categories and point to areas where further discussions and research may be needed.

"Industry consolidations and streamlining [has] led [employers] to cut back on the number of apprenticeships they supported."

The Retirement Effect

Although it does not appear likely that electric-sector employers anticipate much new employment growth anytime soon, the survey results suggest that turnover due to retirements over the coming years could create a skills vacuum in some areas, as large numbers of highly-skilled workers retire and must be replaced by less experienced workers. Employer projections show that 800 craft workers are expected to retire from these companies over the next five years, and employers report that all 800 of these positions will need to be refilled. In the meantime, these employers are attempting to fill 276 job openings, and for many employers this has proven to be an increasingly difficult task.

Recruiting experienced craft workers has led to more intense and more costly recruiting efforts, with employers looking increasingly to out-of-state applicants and paying higher wages. Some organizations are filling these skill gaps temporarily through contractors and greater use of overtime, and some companies have adjusted their hiring expectations downward to meet recruiting goals. Remote assignments, travel and other working conditions are challenges to recruiting and hiring, and these challenges are compounded by a tighter labor market and an aging workforce for which there are many options and preferences.

Line workers and technicians were identified as the jobs that are most difficult to fill, however the current job vacancies and projected retirement rates for mechanics (at nearly 31 percent) and electricians

(nearly 25 percent) suggest that these positions will also become harder to fill. The low number of mechanic apprentices raises questions about how companies will fill the skill gaps for this occupation. Employers are also concerned about current and future shortages in certain engineering occupations, due in part to low enrollments and a lack of energy-specific engineering degree programs.

It seems likely that meeting future demand for skilled craft workers will also become more difficult due to a shrinking population of working age adults. Currently, 57 percent of Washington's utility workers are 45 or older, as are 58 percent of utility workers in Oregon. Similar trends exist for related industries like manufacturing, which has served as a secondary source of skilled labor for electric-sector employers. For both states, general population forecasts show that over the coming decades the pool of working age adults will grow more slowly than adults reaching retirement age, which could create a more competitive environment for skilled craft workers.

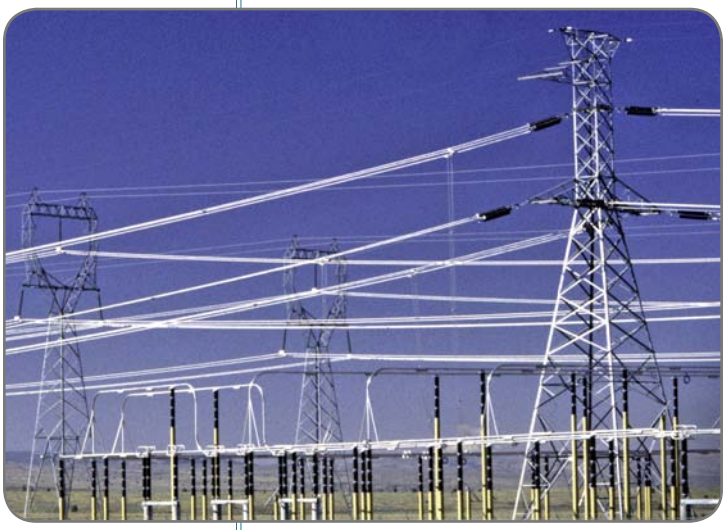
Solar panels

Photo courtesy of Puget Sound Energy

Adding to the difficulty of replacing a growing number of retirees is the internal churning that is likely to occur during these transitions. In part, this is because craft positions are typically replaced through internal promotions as they occur, assuming qualified internal candidates exist. While this may be an effective strategy during periods when retirements occur at a low or stable rate, having to replace large numbers over a shorter time frame could be a challenge for some employers, and may cause a ripple effect with implications for employment and training. As skilled craft workers retire, companies will need to promote and train their replacements. Employment gaps created by those who move up will also need to be addressed, as new workers may need to be hired to fill gaps created at the entry level. As noted at the beginning of this report, however, the future labor pool of new workers is likely to be

smaller and less well prepared than the workers they are to replace, posing new challenges to electric-sector employers and the education and training programs that support them.

Finally, while the results of this study cannot be generalized to the broader population of electric sector employers, the retirement estimates provided by these 12 regional employers probably understate the true number of craft worker retirements that will occur in the region. For instance, in 2005 average employment in all local, federal and private utilities in both states combined totaled more than 26,200 (8,476 in Oregon, and 17,741 in Washington).[34] Total employment at the 12 employers included in this study was 16,467, or around 63 percent of employment at all utilities (based on 2005 data). This is a rough estimate at best, and does not account for the small percentage of employment at these companies outside of Washington and Oregon. However, it seems reasonable to assume that the number of craft worker retirement projections among the remaining employers would raise the total number far above the 800 retirements forecast in this study.



Bakeoven Substation in Maupin Oregon

Photo courtesy of Bonneville Power Administration

Is The Industry Prepared?

The survey results suggest that while most employers recognize the importance of developing and using a formal workforce planning and succession plan, relatively few have developed formalized plans or processes to regularly analyze data, to predict turnover, examine labor market shifts, and to develop strategic solutions to fill future employment and skills gaps.

The current labor shortages combined with findings from internal analyses and industry reports appear to have generated greater

recognition and support by industry executives to invest in succession planning, risk assessments and the development of action plans. Although some effective planning models were noted in this study, for most employers the development of workforce succession plans and related strategies for craft occupations are still evolving.

The study results show that the challenges associated with recruiting, hiring and retaining craft employees have increased, and that retirements and a shrinking labor supply are likely to intensify competition for new and experienced craft workers. Although some employers are thinking strategically about risks and solutions to future labor shortages and some have detailed plans in place, they are the exception. In short, while all employers included in this study recognize that there is a looming labor market problem, it appears that most organizations have been slow to develop strategic plans and action steps aimed at helping them overcome these challenges and improve the odds that they can achieve their future workforce goals.

"Recruiting experienced craft workers has led to more intense and more costly recruiting efforts, with employers looking increasingly to out-of-state applicants and paying higher wages."

Short-Term Solutions and Action Steps

Employers have already begun to identify and implement solutions to reduce the effects of near-term labor shortages, and it seems likely that more employers will need to employ these and other strategies more frequently to fill future skills gaps. In addition to some of the planning and actions described earlier, comments from employers point to other strategies as well:

- Encouraging skilled workers to delay their retirement dates by enhancing retirement benefits or other incentives
- Re-hiring retirees to temporarily fill critical skill gaps, or to train new workers
- Restructuring jobs or increasing the use of technologies that reduce labor requirements
- Expanding internal and external training options
- Increased use of incentives, flexible compensation options and

benefits to attract and retain workers

Longer-Term Solutions

For the long term, it also seems prudent for employers to enhance and build upon the existing workforce education and training systems that are already in place, while also pursuing new strategies to expand the pipeline of new talent for the industry. While apprentice craft workers now comprise more than 10 percent of all craft employment at these companies, the number of new apprentice enrollments among these companies seems low in comparison to the number of predicted retirements. It will take these apprentices 3-5 years or longer to reach journey-level status, and some will opt out of their programs.

Currently, 57 percent of Washington's utility workers are 45 or older, as are 58 percent of utility workers in Oregon.

Moreover, with a shrinking supply of experienced workers, employers' ability to hire experienced workers on the open market may become increasingly limited. Thus, one recommendation is for employers, their unions and college partners to examine statewide apprenticeship enrollment and participation trends to help determine how best to restore apprenticeship training capacity to accommodate a larger numbers of trainees. Additional federal and state support for craft apprenticeships may be needed to help employers offset some of the costs of restoring apprenticeship capacity.

A second recommendation is for employers, unions and two-year colleges to work more closely together to identify current and future skill requirements for craft workers. Although some effective partnerships already exist, they appear to be the exception, and electric-sector employers generally do not describe their current partnerships with area colleges to be very strong. In Washington, new and expanded energy technology programs at a few two-year colleges have been the result of much input and collaboration between employers and unions. In Oregon, some industry-education partnerships have worked to provide new programs and upgrade training, and to recruit students to energy careers. Some of these programs have been extended to colleges in other regions, and online delivery options and new short-term certificates have been created.

The number of collaborative partnerships will need to be expanded in

order for electric-sector employers to leverage the capacity of two-year colleges and other postsecondary institutions to help boost the supply of new workers for the industry. As mentioned earlier, retirements and job promotions will increase the need for upgrade worker training. For employers, expanding their relationships with local and regional colleges and other training institutions would be a wise short-term goal. This will enable colleges to better understand the specific upgrade training needed by different employers, and the methods of delivery that can best meet their needs. Long-term, these partnerships will also help electric-sector employers identify new jobs and skill sets required to support employment growth in clean and renewable energy.

PUD Panorama

Photo courtesy of Grays Harbor PUD

One important question is how two-year colleges can best support the development of the future craft workforce. Although some respondents said that they like the broad educational foundation that a two-year degree can provide, employers do not currently require them for employment in craft positions. Assuming that apprenticeship continues to provide the primary educational strategy for craft trainees in the foreseeable future, it is worth considering how the completion of a degree, specialized certificate, or credit for prior learning experiences issued by a college or other training provider could be used to give apprentice applicants advanced standing in their programs. This approach is now being implemented on a limited basis by some employers with support from their labor unions and college partners, and could serve to reduce the time required of trainees to achieve journey-level status, free-up more enrollment slots, and help reduce training and program expenses. At the same time, this type of innovation can help to expand the training and support role—and training investments—that two-year colleges and other providers can bring to help boost the future supply of qualified craft workers.

Retaining and developing skilled craft workers will also become an increasingly important function for human resources and training staffs. The findings from this study suggest that craft workers are likely to have many opportunities to change jobs and employers in the future. Also, employers will need to cultivate the skills and career options of existing craft workers because they will likely provide the best and most efficient replacements for retirees; these workers also understand the industry and company culture, including the unique technologies and work processes that are used. Developing career ladders for craft workers can provide another way to help employers, educators and employees connect upgrade training, degrees, and short-term certificates with future career options. Recognizing and providing for the career development needs of craft workers is also strategic, enabling employers to continue to leverage their human capital investments, while providing employees with new work options and opportunities that may help reduce turnover, delay retirements, and control recruiting and training costs.

"The challenges associated with recruiting, hiring and retaining craft employees have increased... retirements and a shrinking labor supply are likely to intensify competition for new and experienced craft workers."

Boosting the Labor Supply

Implementing new hiring strategies and building training capacity represent important action steps. However, the fundamental problem facing these electric-sector employers is an inadequate *supply* of future craft employees. National and regional labor shortages, retirements and growing competition for qualified workers will exacerbate the problem. These workforce challenges are widespread, and it seems doubtful that electric-sector employers in the region will find much relief by looking to external labor markets to meet their employment and skill needs. Rather, expanding the supply of qualified craft workers probably will require regional, state and local initiative, with new strategies and resources aimed at both attracting young people to these careers, and preparing them to succeed in the workplace.

This is not a job that can be accomplished by employers alone. Secondary and postsecondary education, organized labor, workforce and economic development partners will need to work together to help grow the workforce. One straightforward goal should be to support a formal marketing/outreach campaign aimed at improving the

image of craft jobs and attracting more young people to the industry. Another useful goal would be to expand work-based learning opportunities for students, to help expose students to craft careers, and emphasize the importance of solid basic skills. Targeted outreach to women and ethnic minorities is critically important, as these populations are underrepresented in most craft occupations, and ethnic minorities will soon comprise a large source of working-age adults in the region.

Workers at Substation 10

Photo courtesy of Snohomish County PUD

Low enrollments in science, technology, engineering and math (STEM) courses in secondary schools represent a long-range challenge that stands to intensify competition for a shrinking number of technically-prepared new workers across different industry sectors. Modest degree production in relevant engineering and technology programs by community and technical colleges and four-year institutions are symptomatic of the longer-term challenges to expanding the pipeline of qualified new workers for electric-sector jobs. The alternative to focused regional action, however, is to become even more dependent on external sources for new craft employees, while gambling that these labor markets will eventually rebound. The results of this survey would suggest that this is neither a wise nor feasible option for the industry or its partners.

Recommendations for Further Research

The study findings also reveal areas where additional research may be useful to industry, education, economic development and workforce partners. Some potential topics include:

- **Engineering workforce**: A study of engineering workforce demand and skill requirements
- **Apprenticeship**: Analysis of apprenticeship trends and capacity

issues for craft occupations

- **Succession planning:** Development of a Best Practices model for workforce planning and succession
- **Clean energy:** Analysis of current and future job demand and skill requirements for clean energy occupations

Power plant near Centralia, Washington

Photo courtesy of TransAlta

ENDNOTES

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15 State of Oregon Employment Department, OLMIS, 2007.

16 Sources: Washington State Employment Security Department, 2007; Oregon Employment Department, 2007.

17 Source: Washington State Employment Security Department, LMEA, 2007; State of Oregon Employment Department, OLMIS, 2007.

18 Source: Northwest Power and Conservation Council, 2005.

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Appendix A

Craft Worker Job Requirements Summary

	Operator	Mechanic	Electrician
Work Experience	2-4 years Journey-level experience via Apprenticeship or past equivalent experience. (Trade or vocational school certification, or military experience**)	2-4 years Journey-level experience via Apprenticeship or past equivalent experience. (Trade or vocational school, college, or ASE Master certification**)	3-5 years Journey-level experience via Apprenticeship or past equivalent experience. (Two-year trade school or college plus 2 years relevant experience**)
Licenses	State Driver's License, Commercial Driver's License*, First Aid card, CPR certification, Operators' License*	State Driver's License, Commercial Driver's License*, First Aid card, CPR certification, some equipment certifications (forklift, backhoe)*	State Driver's License, Commercial Driver's License*, state First Aid card, CPR certification, some equipment certifications (forklift, aerial lifts)*
Education	HS diploma or equivalent*	HS diploma or equivalent*	HS diploma or equivalent*

* Not required by all employers
** Allowed by a few employers

Craft Worker Job Requirements Summary

	Operator	Mechanic	Electrician
Testing	NJATC Aptitude test*, PEO or POSS test*, equipment testing, respirator testing, pre-employment physical*	WA state exam for chemicals on vegetation*, mechanical aptitude testing*, respirator and heat stress testing, pre-employment physical*	JATC selection tests, safety testing and equipment certifications, pre-employment physical*
Special Skills	Requires spatial ability, depth perception, and color discrimination; Use of two-way radio, safety equipment and complex systems	May be required to perform other craft work as needed. Must perform welding, fabrication. Maintain project roads*	May be required to perform other craft work as needed*. Use of two-way radio, safety equipment and specialized tools*
Work Conditions, Requirements	Work in adverse weather conditions and terrain, confined spaces; hazardous conditions and materials; may require overtime and emergency shifts. Live within reasonable commute (one hour or less)*	Work in adverse weather conditions and terrain, confined spaces; hazardous conditions and materials; may require overtime and emergency shifts. May require travel to remote locations*	Work in adverse weather conditions and terrain, confined spaces; hazardous conditions and materials; may be required to work overtime and emergencies. Live within reasonable commute (one hour or less)*

* Not required by all employers
** Allowed by a few employers

Craft Worker Job Requirements Summary

	Technician	Line Worker
Work Experience	2-5 years Journey-level experience via Apprenticeship or past equivalent experience. (Two-year trade school or college plus 2 years relevant experience, or military experience**)	3-5 years Journey-level experience via Apprenticeship or past equivalent experience.
Licenses	State Driver's License, Commercial Driver's License*, First Aid card, CPR certification, Flagging certification, Wireman/Meterman card*	State Driver's License, Commercial Driver's License*, First Aid card, CPR certification, Flagging certification, some equipment certifications (forklift, aerial lifts)*, Lineman card*, May require pesticide applicator's permit*
Education	HS diploma or equivalent*	HS diploma or equivalent*
Testing	JATC selection tests*, POSS/MASS Aptitude tests*, safety testing, equipment certifications, pre-employment physical*	JATC selection tests*, Aptitude tests, pre-employment physical*

* Not required by all employers
** Allowed by a few employers

Craft Worker Job Requirements Summary

	Technician	Line Worker
Special Skills	May be required to fill other positions as needed*. Requires spatial ability, depth perception, and color discrimination. Use of two-way radio*	May perform as Foreman as needed*. Perform pole top and bucket rescue. Must participate in CVR/DAS equipment training*
Work Conditions, Requirements	Work in adverse weather conditions and terrain, confined spaces; may require overtime and emergency shifts. Live within reasonable commute (one hour or less)*. May require travel from site to site.*	Work in adverse weather conditions and terrain, confined spaces; hazardous conditions and materials; may require overtime and emergency shifts. May require extended travel*. Live within reasonable commute (one hour or less)*.
	* Not required by all employers ** Allowed by a few employers	