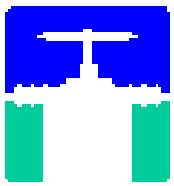

SECURING OUR FUTURE: DEVELOPING THE NEXT WORKFORCE:

AN ANALYSIS OF RISK AND RECOMMENDED STRATEGIES FOR THE NATURAL GAS PIPELINE INDUSTRY

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F-2007-02
July 2007

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EXECUTIVE SUMMARY

Introduction

The natural gas transmission industry faces a difficult challenge in maintaining an adequate technical workforce today and throughout the next decade. This study assesses the risks to the industry's workforce and knowledge assets resulting from the present level of internal company activities along with external factors. The analysis is based on data gathered from executives, managers, operations and human resource professionals within the natural gas transmission industry and secondary data sources. Recommended strategies are given for the INGAA Foundation and member companies to follow along with short-, medium- and long-term actions necessary to meet the workforce challenges.

In brief, these are the study's major findings:

Many executives believe their companies are adequately managing their workforce and knowledge assets, while lower-level managers report they are not committing sufficient time or resources.

While 29 percent of executives were "very confident" of their company's ability to maintain their workforce and knowledge assets, less than three percent of managers, operations and human resources respondents were equally confident. Just one in twenty company managers reported sufficient time to plan and implement workforce and knowledge initiatives.

Strategy

- Build awareness that understanding and acting on workforce issues are critical to successful business operations.

Action

- Increase communication between the INGAA Foundation, executive leadership and company management.
- Develop a workforce business case to justify additional resources.

Companies attempt to compensate for their 13 percent average annual attrition by training new employees faster. Few companies focus on retaining existing employees.

Employees are changing jobs faster than in the past. Over one-third of non-retirement attrition is the result of employees moving within the industry and most human resources professionals expect that figure to stay the same or rise. Only one in eight companies have a goal for non-retirement attrition, and only one in three measures employee satisfaction, the key predictor of future attrition. The present level of attrition costs an average company over $10K annually per employee.

A lack of time and resources is blamed for the limited strategic planning and implementation of workforce initiatives. When asked what actions are underway, 49 percent of respondents reported increased efforts in developing new employees, 30 percent reported increased recruitment efforts, 13 percent reported retention efforts, and nine percent reported initiatives to increase the supply of skilled technical candidates.

Strategy

- Emphasize retention of the existing workforce.

Action

- Create a goal for attrition and implement actions to reduce it, including:
  - Phased retirements
  - Longevity benefits
  - Improved employee satisfaction
  - Compensation benchmarking
- Work towards an attractive reputation as an employer, thus reducing attrition and increasing company attractiveness to new-hire candidates.

Managers report that their company's skill development and knowledge management efforts are not adequate.

More than half of managers report that present skill development for technical employees is inadequate. Seventy-eight percent of managers expect workforce issues to have a significant impact on the company capability within five years, with loss of knowledge mentioned most frequently. Some report impending retirements of "irreplaceable" employees. Half of managers feel their companies' knowledge management processes are insufficient to capture knowledge from retiring employees.

Strategy

- Safeguard existing critical company knowledge and develop the organization's capability.

Action

- Identify knowledge management risks and mitigate them through knowledge capture, job shadowing, mentoring, and documentation of processes, procedures and standards.
- Prioritize skill development plans according to the risk to operating capability.

Transmission companies will need to add three to five percent annually to their workforce over the next five years, adding an additional burden on the recruitment resources.

Experienced engineers are the most difficult technical employees to recruit. Human resources reports that they hire four experienced employees for each new graduate. This level may not be

sustainable with the expected growth rate of three to five percent and the ten percent attrition out of the industry each year.

Strategy

- Build a good industry reputation by marketing the natural gas transmission “brand”.

Action

- Create a marketing plan to make natural gas transmission careers attractive to students and the general public. Develop the natural gas brand in collaboration with other industry organizations.
- Reach out to secondary schools and career centers. Make them aware of opportunities in the industry.

Strategy

- Increase opportunities for technical training in the natural gas transmission industry.

Action

- Use available government resources, standardized curriculums, apprenticeships, and scholarships for training new technical employees. Add company resources when required.

Strategy

- Increase recruitment effectiveness and ensure attractive job positions and compensation.

Action

- Review/revise recruitment methods and resources. Use existing INGAA Foundation materials. Consider alternative sources of candidates outside of local recruitment area or from other industries.
- Review baseline hiring requirements and consider hiring lower-skilled new-hires for work/study or apprenticeship programs.

Conclusion

The research presented reveals how critical addressing workforce issues is to the continued success of the natural gas pipeline industry – and how many natural gas companies often fail to consider adequately all of these issues in their planning. The study offers specific workforce strategies to consider and actions to take. Since these workforce issues affect every area of the industry and individual companies, from operations to human resources to company leadership and beyond, they must be – and deserve to be – examined from all perspectives and brought to the forefront of business planning.

I. INTRODUCTION

SCOPE

Phase I Strategic Plan – "Securing Our Future – Developing the Next Workforce"

The Phase I deliverable is a comprehensive report and strategic plan to address workforce issues impacting the future of the natural gas transmission industry in North America.

The plan focuses on "the technical workforce in the transmission segment of the natural gas industry that is responsible for design, construction, operation and maintenance of pipelines." Applicable job classifications are engineering, trades, and operations. Marketing, accounting, sales, and management are not included at this time, but may be considered in a follow-on project. Midstream and gathering segments are outside of the scope. They will be considered as an external industry that competes for the same workforce resources.

The overall strategy incorporates external trends and influences with internal company actions and policies, providing an effective strategic roadmap for the INGAA Foundation and its members in terms of short-, medium-, and long-term actions.

INGAA FOUNDATION STEERING COMMITTEE MEMBERS

Chad Fletcher, Enginuity, LLC

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Lisa S. Beal, Interstate Natural Gas Association of America

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Kim McCaig, Canadian Energy Pipeline Association

Debbie Ristig, CenterPoint Energy Pipeline Services

Jackie Ross, TransCanada

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II. STUDY METHODOLOGY

The research and data gathering was conducted in three ways:

- Executive interviews with INGAA Foundation members to assess the perceived importance and information available to industry leaders about workforce and knowledge
- Management surveys of INGAA Foundation members that requested detailed workforce and knowledge data from human resources, operations and other company managers
- Secondary research of public information, publications and commercially available data

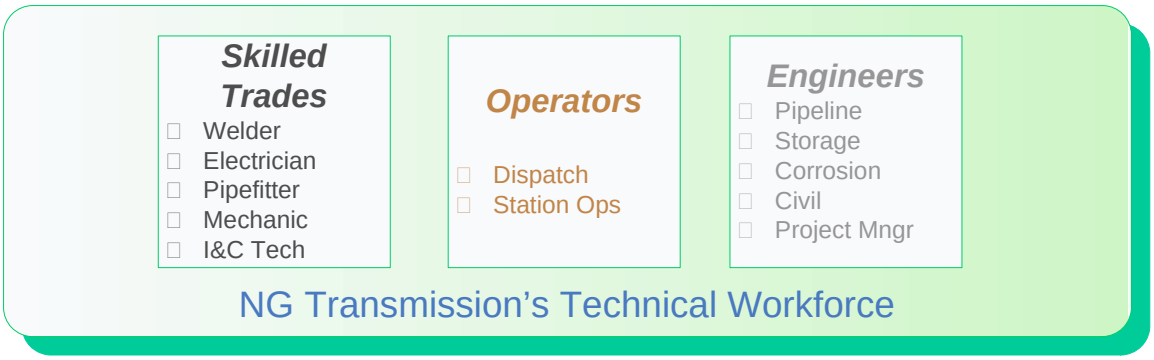
The workforce strategy was based on analyzing and integrating this data under the guidance of the INGAA Foundation steering team.

The INGAA Foundation workforce strategy is a customizable roadmap for companies in the natural gas pipeline industry. It helps them manage the impending challenges in workforce and knowledge management. The roadmap's key components for maintaining a capable workforce in the natural gas industry are:

- **Supply** – Ensure there are enough new, skilled workers willing to take on positions in the transmission industry -- now and in the future.
- **Recruit** – Attract the required numbers of new hires in a timely manner by offering competitive compensation packages and well-defined, challenging positions.
- **Develop** – Employ effective skill development and knowledge management that maintains the company's knowledge assets for use in preparing new employees for their positions, allowing fully-qualified employees to develop new skills, and supporting corporate-wide operating improvements.
- **Maintain** – Retain skilled, committed, and motivated employees while meeting budgetary goals.

The *supply* goal will be a focus for the INGAA Foundation and industry roadmaps, along with supporting member companies' actions for reaching the *recruit*, *develop*, and *maintain* goals.

Some of the key job positions are shown in the following table.



III. KEY FINDINGS

EXECUTIVE INTERVIEWS

Twenty-one executive interviews were conducted to gain a perspective of workforce issues from the executive leadership of the natural gas industry. The executive interview script questions shown in Appendix A were a starting point to explore the criticality of workforce issues -- among the top concerns in the industry -- and expected trends.

Most executives and managers are focused on short-term issues instead of long-term strategies. They view workforce issues as a tactical problem and manage them this way:

- Hire from a larger geographic area
- Make more phone calls
- Use more recruitment firms

Knowledge management is predominately viewed as documenting processes and procedures.

Most executives reported that their human resources groups were taking action on present and impending workforce issues. Executives were much more confident than other managers that workforce issues would not adversely affect their company operations.

Challenges Facing the Industry

When asked "Think about the most important issues/challenges facing the natural gas transmission industry. What are the most critical issues in the short-term? The medium-term? The long-term?" executives from service provider companies reported higher level of concerns about workforce. This may be a result of service providers' need to increase and decrease their workforces quickly because of project requirements.

Pipeline company responses:

- Regulatory (7 comments) - Carbon and greenhouse emissions (3), Rate cases that allow ROI (2), Changing regulations (1), Integrity management regulations (1)

- Workforce (6 comments) - Availability of skilled labor (4), Increasing costs (2)
- Resources to support volume of projects (4 comments) - Equipment (2), Materials (1), General resources (2)
- Changing Industry (1 comment)- Future gas supply (1)

Service providers' responses:

- Resources to Support Volume of Work (14 comments) - Forecasting and planning (5), Construction boom (3), Equipment (3), Materials (2), Capital (1)
- Workforce and Knowledge (13 comments) - Workforce (9), Skills (2), Attrition (1), Knowledge management (1)
- Regulatory (6 comments) - Compliance with DOT (1), Climate change (1), Comprehensive energy policy (1), Speed of approvals (1), General regulatory (2)
- Competition (6 comments) - Other fuels (3), Foreign supply of natural gas (1), Inter-industry (1), General competition (1)
- Changing Industry (6 comments) - Industry leadership in changing times (2), Effects of LNG (2), Gas supply (2)
- Public and Political (5 comments) - Landowners (2), NGOs (1), Public perception of industry (1), Politics of implementing global solutions (1)
- Revenue (3 comments) - Variability in pricing projects (2), Sustaining profitability (1)

Support Needed From INGAA and the INGAA Foundation

Executives generally felt that the INGAA Foundation could make a positive impact on the workforce problem, mainly by working to increase the supply of technical candidates and by providing resources for employee training and development. The supply recommendations were:

- Promote the industry.
- Help with increasing immigration.

The training recommendations were:

- Develop an educational program or provide a directory of resources.
- Assist with training grants or government subsidies.
- Develop consistent industry standards to reduce training costs.
- Work towards standardized Operator Qualifications.

Service providers also requested help with forecasting project opportunities and their workforce impact, and working with FERC to relax construction windows.

SUPPLY OF NEW TECHNICAL EMPLOYEES

Skilled Trades

The Department of Labor (DOL) predicts that employment in skilled trades will rise by up to 16 percent over the 2004 to 2014 period. The following table provides some examples by trade.

National Employment Trends	Employment		Percent	Present
	2004	2014	Change	Openings
Operating engineers and other construction equipment operators	381,600	425,900	12%	14,240
Welders, cutters, solderers, and braziers	377,000	395,900	5%	12,540
Control and valve installers and repairers, except mechanical door	37,800	39,700	5%	1,130
Electrical and electronics repairers, commercial and industrial equipment	72,400	79,400	10%	2,290
Industrial machinery mechanics	219,900	219,500	0%	4,430
Pipelayers	62,400	68,600	10%	2,050
Plumbers, pipefitters, and steamfitters	498,600	576,600	16%	19,270

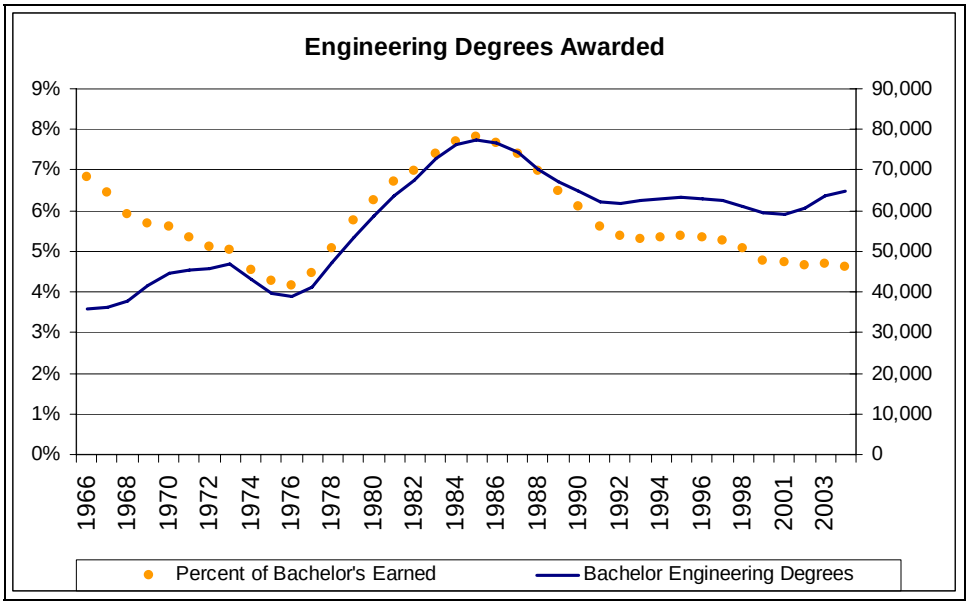
However, the DOL is unable to measure the adequacy of training in the skilled trades because there are no reliable figures as to the number of persons being trained, or a standardized curriculum. A sample of schools was assessed for their training in heavy equipment operation. These trade schools, colleges, and universities offered heavy equipment operator training programs that ranged from four months at a cost of $1,800 to four years at a cost of $15,000. More details of the available trade school programs for equipment operators and pipelayers and pipefitters are shown in Appendix D.

The DOL predicts mergers and acquisitions and changing technology will result in higher employment for construction and maintenance workers and lower employment for operators. Construction occupations are expected to grow 45 percent faster than overall jobs in the next ten-year period. Computer systems analysts, network systems analysts, and data communications analysts and technicians are expected to be among the fastest growing occupations in the natural gas transmission occupations group, as plants emphasize automation and productivity.

The Department of Labor does have grant resources available. One program is *High Growth Grants,* which awarded $35 million in grants from 2003 to 2006 for the construction industry. The Employment and Training Administration of the DOL worked with employers and industry associations to identify their challenges and implement effective workforce strategies in the areas of hiring, training, and retention. Another part of DOL is the Office of Apprenticeship (OA), which provides technical consultation services on the development of apprenticeship standards.

Degreed Engineers

The number of engineers graduating with bachelor's degrees has remained steady for the last several years, although their proportion of the total number of bachelor's degrees has fallen.



Demand for engineers has also remained steady over the past ten years. While the percentage of engineering graduates has dropped in recent years, the Department of Labor forecasts engineering positions increasing at the same or slightly lower pace than overall job growth. The shortage of engineers discussed in many publications is moderate to medium in severity for general engineering degrees.

The Department of Labor does not track specialties within the natural gas industry. Therefore, the supply of engineers in these specialties is not easily quantifiable. Supply shortages for expert natural gas engineers are being experienced by the human resources professionals surveyed in the management study. Human resources professionals report engineers as the most difficult job position to recruit, in particular, engineers with natural gas experience, such as pipeline engineers, project engineers, storage and reservoir engineers, and engineers with skills in friction stir, non-destructive evaluation, and plastics.

Attrition is reducing the number of experienced natural gas engineers by ten percent a year as forecasted growth is increasing the requirements by three to five percent annually.

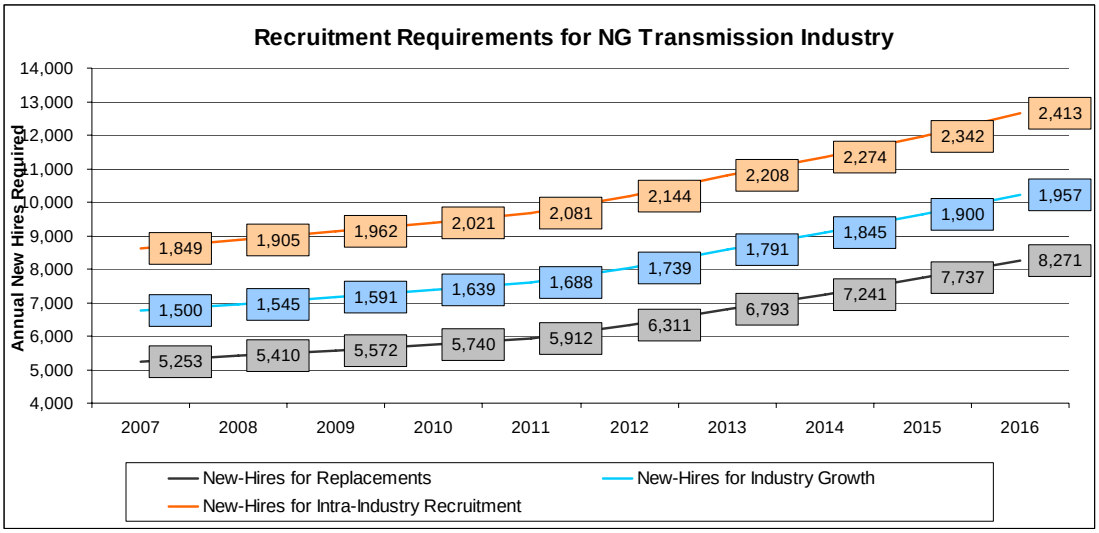
RECRUITMENT

Human resource survey respondents reported that it takes an average of three months to hire a technical employee today, and this time has been increasing over the last several years. Companies are adding external recruiting resources to counteract the limited pool of skilled new-

hires, as most companies prefer to hire fully-qualified candidates. At present, four out of five new hires are experienced, with an average of seven years in their field of work. The most successful recruiting methods involve extra monetary incentives for candidates, such as hiring bonuses or relocation allowances.

The natural gas industry salaries are competitive when compared to other industries and other types of utilities. At present, utility companies pay their technical employees an average of two percent more for engineering positions and 21 percent more for other technical positions (e.g., supervisors, electricians, operators, control-valve installers). Within the utilities, the electric utility industry pays an average of five percent more than the natural gas industry.

Using a baseline of 11,000 pipeline and 39,000 services technical employees, and an employment growth rate of 3% annually, the following chart shows the recruitment requirements for: replacing employees that retire or leave the industry, additional workers for employment growth, and replacement workers for those that change positions within the industry.



Recruitment requirements industry-wide:

- At least 5,200 new technical workers must be brought into the natural gas transmission industry each year to make up for attrition caused by retirements or workers leaving the industry.
- Natural gas transmission companies' expected growth will increase the number of new-hires required by 1,500 annually.
- Intra-industry recruitment adds the need for an additional 1,800 hires.
- The present annual total of 8,600 new-hires is projected to increase by 1,600 employees in five years.

SKILL DEVELOPMENT AND KNOWLEDGE MANAGEMENT

Survey respondents in operations or maintenance functions reported that their companies' employee development and knowledge management processes are only partially sufficient. Respondents were asked to consider their companies' skill development and to exclude other types of training such as safety, diversity or similar programs. More than half of respondents responded that there is inadequate training for existing employees. The meaning of "adequate" was left to the judgment of the survey respondents.

Half of respondents have alliances with educational resources. Of those without alliances, 71 percent think this would be beneficial and 70 percent would like support in implementing this type of alliance.

Technical survey respondents report about half of their companies have tools in place to capture knowledge, and half of those tools enable process improvements.

Few executives reported a thorough understanding of knowledge management. A complete skill development and knowledge management program includes:

- Training and competency development requirements at the line level
- Forecasted future competency development requirements, paying special attention to at-risk skills and expert knowledge requirements
- Organization needs assessment for scheduling training and curriculum development
- Formal and cost-effective system for developing best practices for achieving gains in efficiency, productivity, and quality and for minimizing losses
- Fully tested and documented best practices that have undergone a job safety analysis, and have been developed into standard policies and procedures

MAINTAINING THE WORKFORCE

Retention was mentioned by only one in eight respondents as a method of reducing the risk to workforce and knowledge management. Eighty-seven percent of companies do not have a target for non-retirement attrition. Two-thirds of companies do not measure employee satisfaction, which is the best predictor of future attrition.

National labor statistics show that employees are changing jobs faster today than they were a decade ago. Delaying the average employee’s attrition by one year can save $75M overall for the industry or $770K a year for a 500-person company. For the 11,000 pipeline technical workers and 39,000 services employees, this is a total attrition cost of $575M dollars annually, and is expected to increase by $93M in five years. $165M of the total cost is caused by the 34 percent of non-retirement attrition attributed to employees changing companies within the natural gas transmission industry.

Research discussed in Appendix C estimates the cost of attrition for exempt employees as 1.5 times their annual salary. Since many technical employees in the industry are non-exempt, the cost of attrition for this example was computed using an estimate of one times the annual salary. This cost of attrition includes recruitment, new-hire orientation and training programs, and lost productivity for the leaving employee, coworkers, customers and the new employee as they gain experience. The total annual cost is estimated by company type:

- $4.0M annually, for an average-sized pipeline company with 460 technical employees and nine percent non-retirement and two percent retirement attrition, using an average of $80K for a fully loaded salary.
- $4.0M annually, for an average-sized services company with 320 technical employees and 13 percent non-retirement and 2.5 percent retirement attrition, using an average of $80K for a fully loaded salary.
- The estimated average cost of attrition is over $10K per year per employee. This will vary by company depending on the attrition rate, average salary, recruitment costs and effectiveness in developing new employees.

Research indicates that reducing non-retirement attrition is mainly a matter of increasing job satisfaction. Job satisfaction is increased by:

- Compensation commensurate with position
- Interesting and challenging work

Job satisfaction is decreased by:

- Physically and psychologically straining work environments
- Restricted social opportunities because of long or irregular hours
- Work inhibitors, such as poor policies, bureaucracy, and inadequate resources

After receiving a competitive salary, younger workers tend to be more attracted to positions that have performance-based pay or career advancement opportunities. Older workers report more interest in health and retirement benefits. Almost two-thirds of retirement-age employees would like to work part-time before retiring completely.

Training increases capability and commitment, in addition to maintaining a skilled workforce in the presence of changing technologies and attrition.

IV. CONSTRAINTS AND RISKS

The elements of a robust workforce and knowledge management process were assessed for the risk level, based on the research data. The following sections briefly explain the most pressing concerns.

EXECUTIVE LEADERSHIP AND COMMUNICATION

Executive leadership are responsible for setting company priorities. In order to do this effectively, they must have accurate information concerning the risks and rewards for addressing workforce issues, along with an assessment of the present state of the company's workforce and knowledge.

High Risk - While 29 percent of executives were "very confident" of their company's ability to maintain their workforce and knowledge assets, only three percent of managers, operations and human resources respondents were equally confident. Many executives were focused on external matters in the natural gas industry such as regulatory issues and competition, while believing that workforce and knowledge management were being adequately addressed by human resources or operations.

RESOURCES FOR STRATEGY, PLANNING AND IMPLEMENTATION

Effectively allocating company resources goes hand-in-hand with effectively setting company priorities and approving workforce initiatives.

High Risk - Just one in twenty management survey respondents reported sufficient time to address overall workforce issues, and one in seven reported receiving additional resources. Forty percent report insufficient time for knowledge capture, and 57 percent reported limited resources available for strategic planning.

SUPPLY OF NEW SKILLED AND DEGREED EMPLOYEES

Ensure there are enough new, skilled workers willing to take on positions in the transmission industry – now and in the future.

- Workforce Planning (headcount and skills) – High Risk – Although most executives agree that workforce is critical, many managers report limited resources and time for workforce planning in terms of forecasting headcount and skill requirements.
- Skilled trades – Medium Risk – It is difficult to quantify supply numbers for skilled trades, because of the lack of standard curriculum and training methods. Education in a trade may take four or more years.
- Operations - Medium Risk - Technology developments will tend to reduce the number of operators required while growth in the industry may increase employment.

- Experienced natural gas technical employees – High Risk – The pool of experienced technical employees in the natural gas industry is shrinking due to retirements and attrition out of the industry. Companies now hire experienced technical employees – many already in the natural gas industry – a practice which does not add to the pool.
- Entry-level engineers – Low Risk – Although the number of engineering graduates remains flat, and falls as a percentage of all graduates, engineering jobs are also forecasted to remain flat compared to overall job growth. Some specialized degrees, such as metallurgy or material science, may be more difficult to recruit than the more common engineering degrees (e.g. mechanical, electrical, and civil).

RECRUITMENT

Attract the required numbers of new hires in a timely manner by offering competitive compensation packages and well-defined, challenging positions.

- Workforce Planning (headcount) – Medium Risk – The Department of Labor forecasts declining employment in the natural gas industry due to technology and mergers. This conflicts with managers' predictions.
- Competition – Medium/Low Risk – Utilities overall pay a competitive wage for technical positions. The electric power industry pays a slightly higher (five percent) hourly wage than the natural gas industry. Although this is not a large incentive for attrition, it may make hiring entry-level employees somewhat more difficult. Human resources respondents rated "salary competition with other industries" well below "finding qualified candidates" as a recruitment inhibitor.
- Attractive Positions – Medium Risk – Good career, work/life balance and work environments are important to attracting and retaining employees. Changing demographics (more women and immigrants in the workforce) may affect the set of attributes that are most important to potential employees.
- Effective Recruitment – Medium Risk – Recruitment today averages three months for hiring technical employees. As recruitment requirements rise over time, present methods may not be sufficient. Human resources reports that monetary incentives are the most effective method, which may result in increased costs for future recruitment efforts.

SKILL DEVELOPMENT AND KNOWLEDGE MANAGEMENT

Employ effective skill development and knowledge management that maintains the company's knowledge assets for use in preparing new employees for their positions, allowing fully qualified employees to develop new skills, and supporting corporate-wide operating improvements.

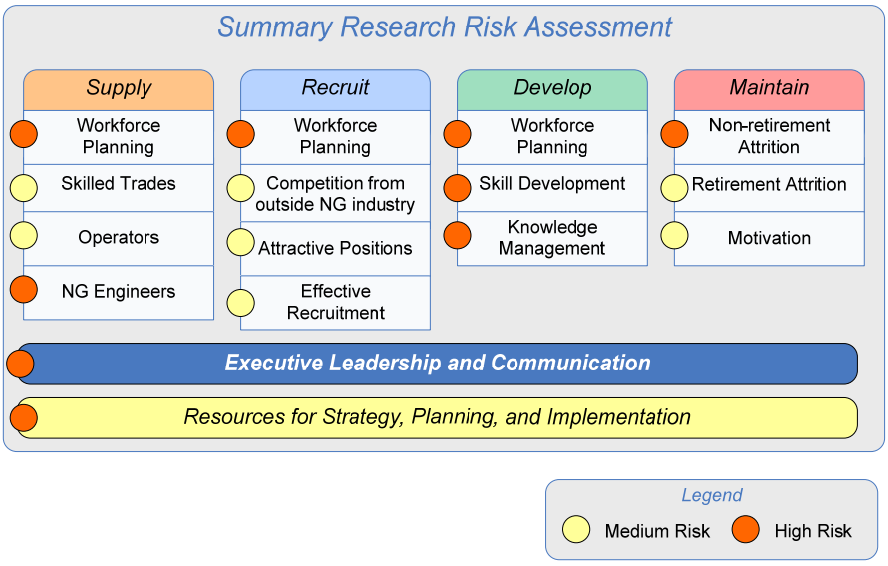
- Workforce Planning (skills) – High Risk – Almost half of managers report insufficient resources and over 90 percent report tight or insufficient time for forecasting skill requirements.

- Skill Development – High Risk – Most technical employees report that additional training for existing employees is insufficient. The pool of available, experienced employees may not be large enough to support the recruitment requirements in growing companies. This, in turn, may increase the need for training new-hires who do not have the full baseline skill set.
- Knowledge Management – High Risk – Most companies do not have a thorough understanding of knowledge management, and are not implementing a comprehensive plan to retain, maintain, and leverage their company knowledge. A third of managers reported that skill and knowledge losses due to retirements are their most pressing workforce concerns.

MAINTAINING THE WORKFORCE

Retain skilled, committed, and motivated employees while meeting budgetary goals.

- Attrition – High Risk – The present rate of 11 percent non-retirement attrition and 2.2 percent retirement attrition results in industry costs of $575M or $10K annually per employee, and this cost is growing. Most companies are not trying to control the attrition level by setting human resource goals, or measuring employee satisfaction – the key indicator of future attrition. Most present employees report insufficient training, which can improve employee job satisfaction while it increases capability.
- Motivation and Engagement – Medium Risk – Survey respondents reported that "interesting work" was the most important factor in a technical employee's career. One study found that boredom was reported by 20 percent of women and 17 percent of men as a factor in their decision to leave a job. Other studies show that performance-based pay can significantly increase productivity and encourages retention of high performers. This type of compensation is more attractive to younger workers.



V. STRATEGIES AND ROADMAPS

To address the risks and challenges facing the natural gas industry, a series of roadmaps are given that address specific recommended actions, based on the research and steering committee expertise.

Individual strategy roadmaps have been developed for each of the four processes in workforce and knowledge management. Before implementation of the roadmap actions, each member company can customize the actions based on an assessment of their present workforce situation and a forecast of their expected situation in one, two, five and ten years. The resulting gaps will allow a prioritization of the order for action, and help to eliminate unnecessary steps.

The overall roadmap is shown on the next page.

GETTING STARTED

Assess Present Situation

The Job Task Analysis is a tool to clearly define the task and skill requirements of a company's job positions. The first step is developing a job profile that will provide individuals and their managers with a performance management tool that describes the job purpose, accountabilities, expected results, performance measures, and reporting mechanisms. It is a living document for managing performance and results. A more detailed task list, organized by equipment or purpose (e.g. reporting tasks or supervision tasks) is developed from the tasks described in the job profile.

The next step is to define the skill and knowledge requirements based on the Job Task Analysis. An assessment of the present workforce capability compares objective or self-assessed skill-sets of the present employees to the Job Tasks. Of particular concern are tasks critical to business objectives and tasks performed frequently. Finally, a Skill Forecast is developed using attrition data and considering any skill change requirements due to new technology.

Build Workforce Plan

The workforce plan is a forecast of both the number and skill-level of the organization in the future, and the required growth or reduction in specific job classifications to meet the plan. The first step is to estimate the expected headcount requirements in the target year. Next, consider attrition and changing technology when determining the types and quantities for each job position. The skill forecasts from the present assessment are then compared to the expected skill/job classification requirements to get a recruitment requirement. The hiring standards and qualifications must also be considered.

Build Training Plan

The most efficient and effective training plans are based on future skill requirements and the company's present training capability and employee training plans. The present and future states, along with capability, will uncover skills and knowledge gaps and missing skill development capability. A customized training plan is then built which considers the employees' skill level, criticality of skills to the operations, and any prerequisite skill development requirements.

Taking Action

At this point, companies have gathered enough information to confidently follow the logic diagrams on the four action roadmaps and create customized and prioritized action plans.

Measure to Plan

Measures should be implemented to manage the workforce development program. The measures should include a clear definition, the data required for the measure, and recommendations for specific owners of the measure. They should also be aligned with the

organization's goals and assigned ownership based on the roles and responsibilities within the organization.

Administration

Administrative policies and procedures are necessary to support the implementation and management of a successful workforce and knowledge management program. Specific roles and responsibilities in the organization are a key component. Other areas that should be addressed are:

- Budget formulation and management
- Policy development
- Program evaluation
- Process management

Knowledge Management

Knowledge management must be carried throughout the workforce management process. As a basic requirement, policy and procedures should be clear, accurate, and available. Additionally, job standards make training new employees more efficient and help employees produce consistent results.

The identification and capture of tacit knowledge for inclusion into the knowledge management system is most effective when it is ensured that the knowledge is accurate and important to the process.

A formal and cost-effective system for developing best practices will achieve gains in efficiency, productivity, quality and reliability. This can come from external benchmarking or from internal process improvement/design opportunities, and from plant performance improvement requirements. Best practices must be tested and undergo a job safety analysis, then documented and incorporated into standard policies and procedures.

Communication

Regular communication about the progress of workforce initiatives and performance measures should occur through all levels of the organization. This ensures corrective actions can be taken as required, such as allocating additional resources or modifying tactics.

Getting Started

Supply
Ensure there are enough new, skilled workers willing to take on positions in the transmission industry -- now and in the future.

Recruit
Attract the required new hires by offering attractive compensation and well-defined, challenging positions.

Develop
Skill development and knowledge management to maintain and leverage company knowledge assets.

Maintain
Retain skilled, committed, and motivated employees while meeting budgetary goals.

Member Company

Administration
Budget Formulation and Management – Policy Development – Monitoring and Reporting Metrics
Program Evaluation – Process Management

Knowledge Management
Identification and Standardization of Best Practices – Policy and Procedure Development and Documentation
Job Standards Development – Identification and Capture of Tacit Knowledge

Communications

Assess Present Situation	Build Workforce Plan	Build Training Plan	Recruitment	Development Retention and Maintenance	Measure Performance to Plan
Job Task Analysis	Headcount Requirements Forecast	Present Training Capability	Supply	Development	
Determine Skill and Knowledge Requirements	Skill Forecasts	Employee Training Plans	Recruitment	Maintenance	
Understand Present Workforce Capability	Skill Requirements	Gap Analysis for Skills and Training			
Impact of Attrition and Technology	Define Hiring Standards and Qualification	Customized Training Plans			
	Recruitment Requirements				

INGAA Foundation

Awareness, Coordination, Information
Leadership Awareness
Government Awareness
Direct Supply Actions
Serve as Information Resource

SUPPLY STRATEGY

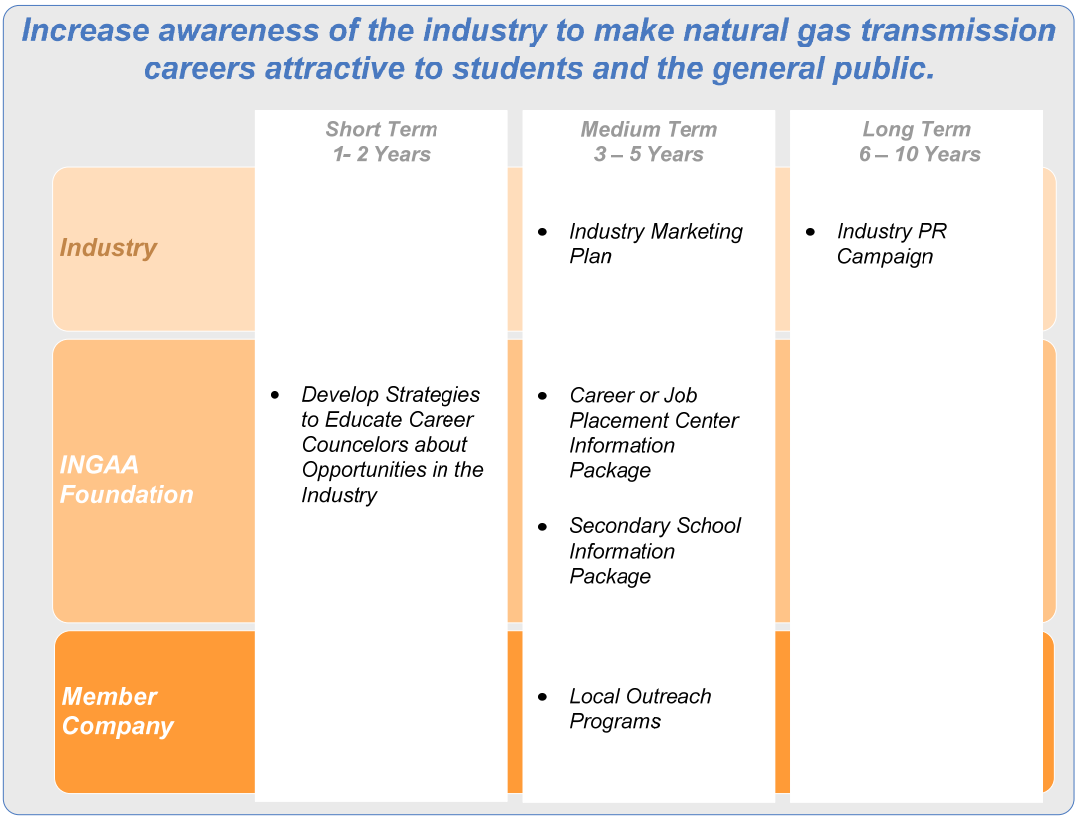
The Supply Strategy contains two main approaches:

- Increase awareness of the industry to make natural gas transmission careers attractive to students and the general public.
- Increase opportunities for technical training relevant to the natural gas transmission industry.

Industry Awareness

The industry awareness campaign should be undertaken as a collaborative effort with other natural gas industry groups. National, regional and local efforts are recommended. On a national basis, the natural gas industry should develop an awareness and public relations marketing plan that focuses on the benefits of using natural gas (e.g. clean fuel, domestic supply, economical). Regional marketing may be more focused on employment and careers, such as the interesting technical aspects of a natural gas career and the expected growth of the industry in terms of employment and revenue.

In addition, a plan to educate career counselors is needed for secondary schools and career/job placement center counselors. The materials should be developed by the INGAA foundation or by a coalition of the industry groups. Individual companies would then be responsible for delivering the training and materials to their local institutions.

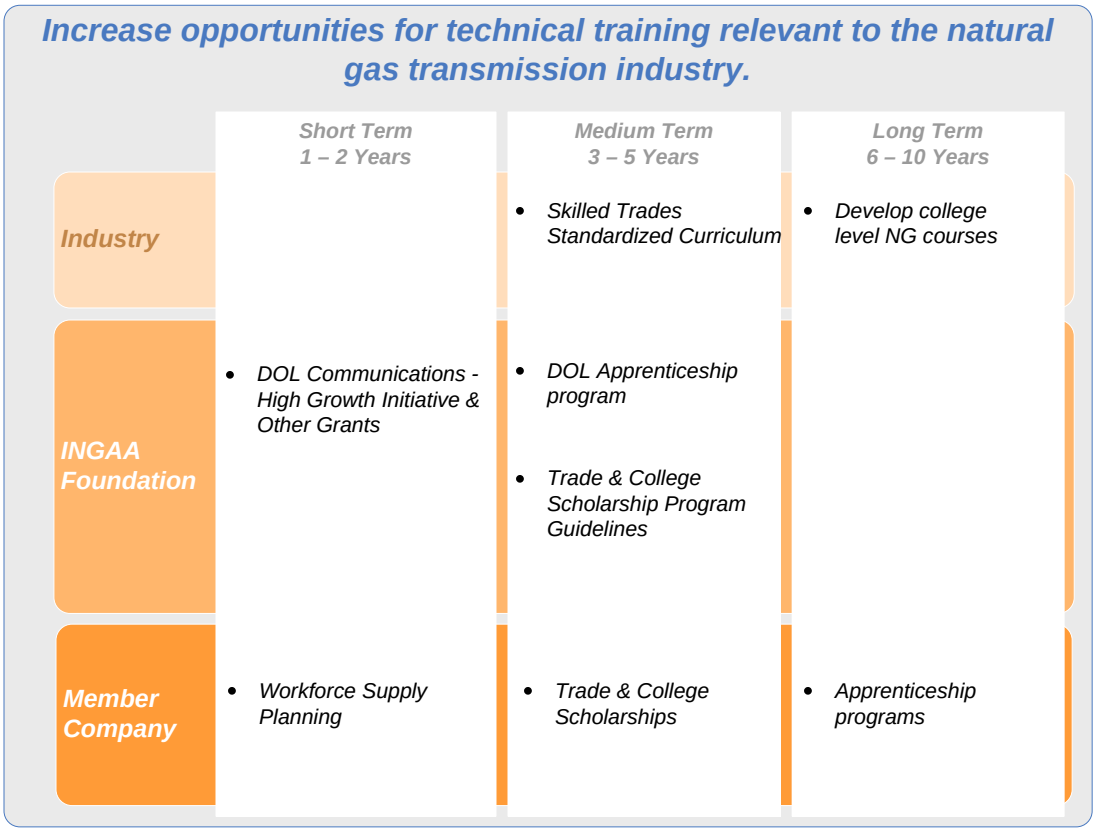


Technical Training Opportunities

The INGAA Foundation and member companies should asses the most critical job skills in short supply before working to locate funding sources. An industry workforce plan, as outlined in the "Getting Started" part of this section, will define the expected headcounts and skill sets required over time and the forecasted gaps.

The Foundation or industry can then undertake a study of the available government grant programs and their applicability to these skills. These include the Department of Labor's Office of Apprenticeship and High Growth Job Training Initiative grant program. In addition to government grants, individual companies can sponsor scholarships based on program guidelines developed by the INGAA Foundation.

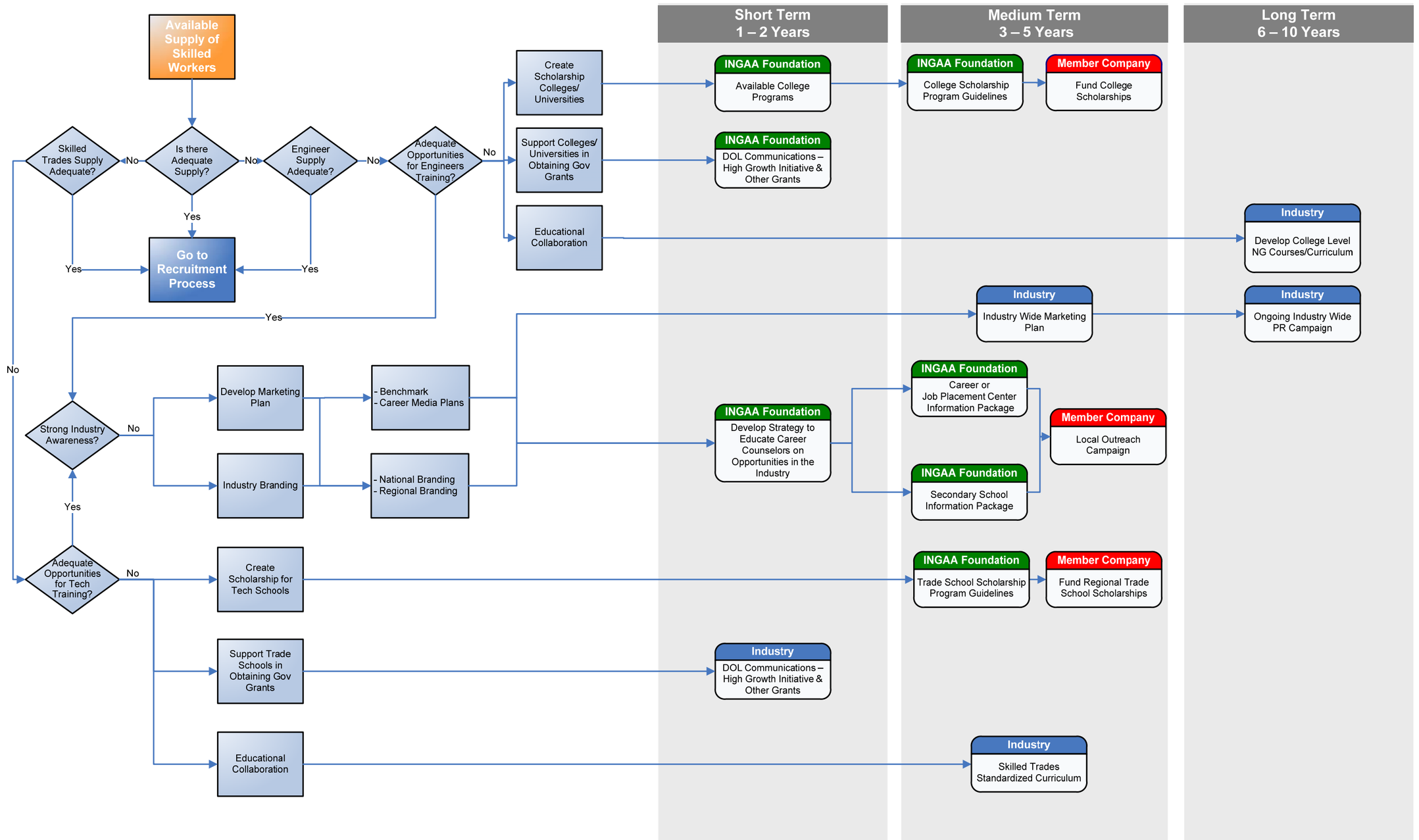
The Foundation or industry should assess the value of developing a standardized curriculum for skilled trades and/or degreed professions. Additional coursework unique to the natural gas industry may be required.



SUPPLY ROADMAP

The following Supply Roadmap is a logic-driven action plan based on the supply strategy. Individual companies and the INGAA Foundation should customize the actions based on the assessment of the present situation.

Supply Roadmap



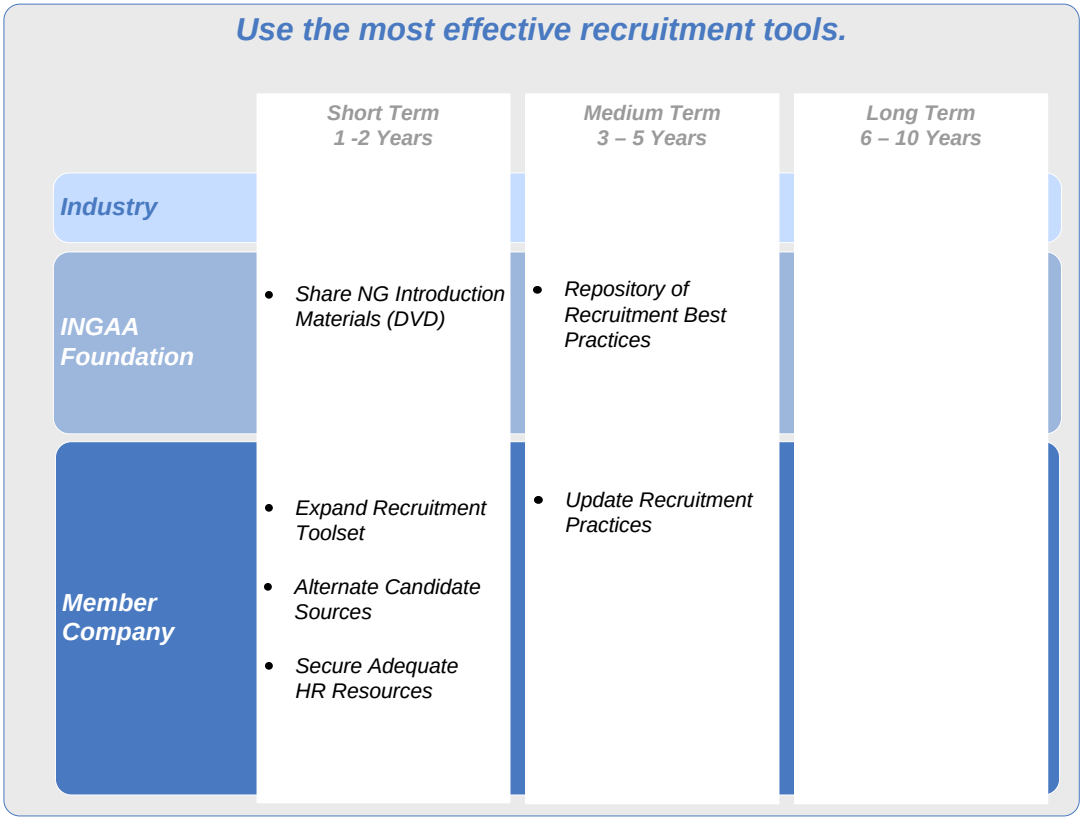
RECRUITMENT STRATEGY

Attracting a sufficient number of qualified technical employees will become increasing difficult as companies in the natural gas industry grow and compete for scarce resources. The strategy depends upon finding the most effective recruitment methods and enhancing the company's reputation as an employer with attractive job positions.

Effective Recruitment

A variety of recruitment tools were rated by human resources professionals in the management surveys. The most effective methods included signing bonuses and reimbursement for relocation expenses. These were followed by internet advertising on the company's website or a national job posting site. Additionally, new methods should be considered, such as looking for alternative sources of candidates outside of the industry or outside of the local geographical area.

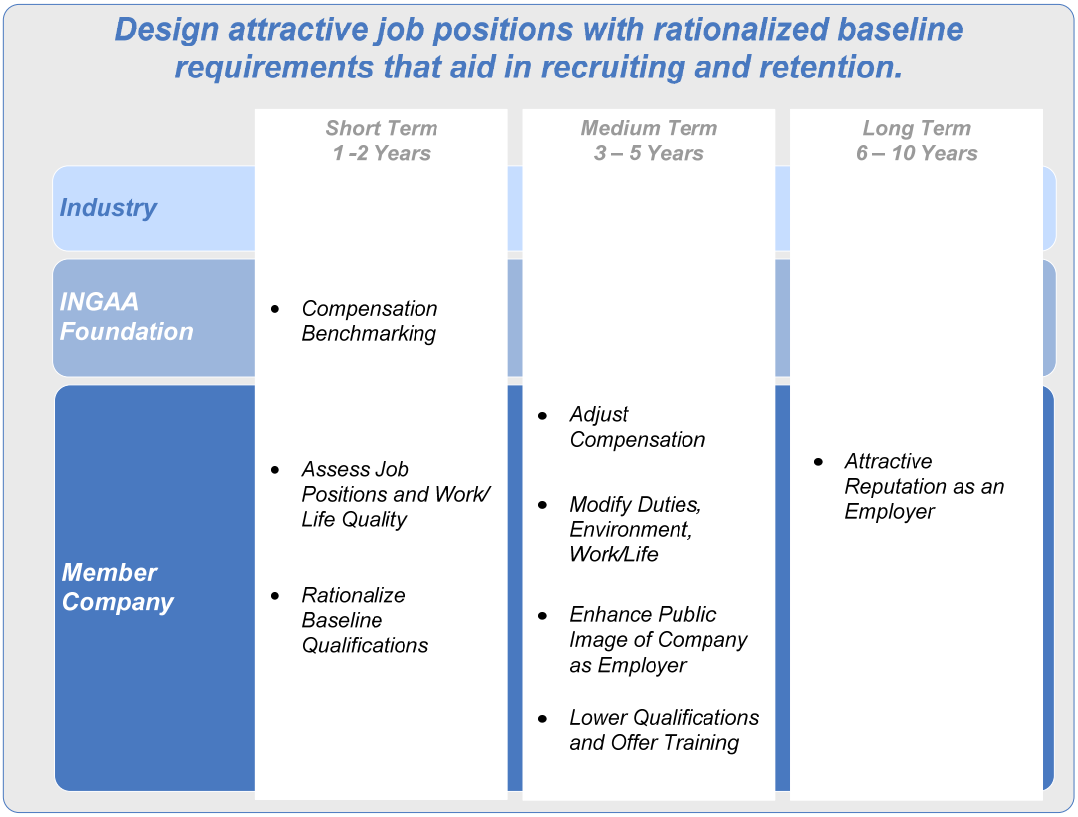
As recruitment requirements rise due to growth in the workforce, present recruitment resources may not be sufficient. The cost of additional recruitment resources should be weighed against the cost to the company of unfilled positions.



Attractive Job Positions

The secondary research found that there are many attributes that affect a candidates' view of the job position. After competitive base salaries, younger candidates are more interested in career advancement opportunities and performance-based incentives, while older candidates are more interested in health and retirement benefits. Salaries are often compared based on job titles, instead of duties, so offering an inflated job title without an increased salary can lead to future attrition. Additionally, the reputation of the employer and work/life balance are top attractors. Making each job position attractive to likely candidates will help increase offer acceptances in this competitive market for technical resources.

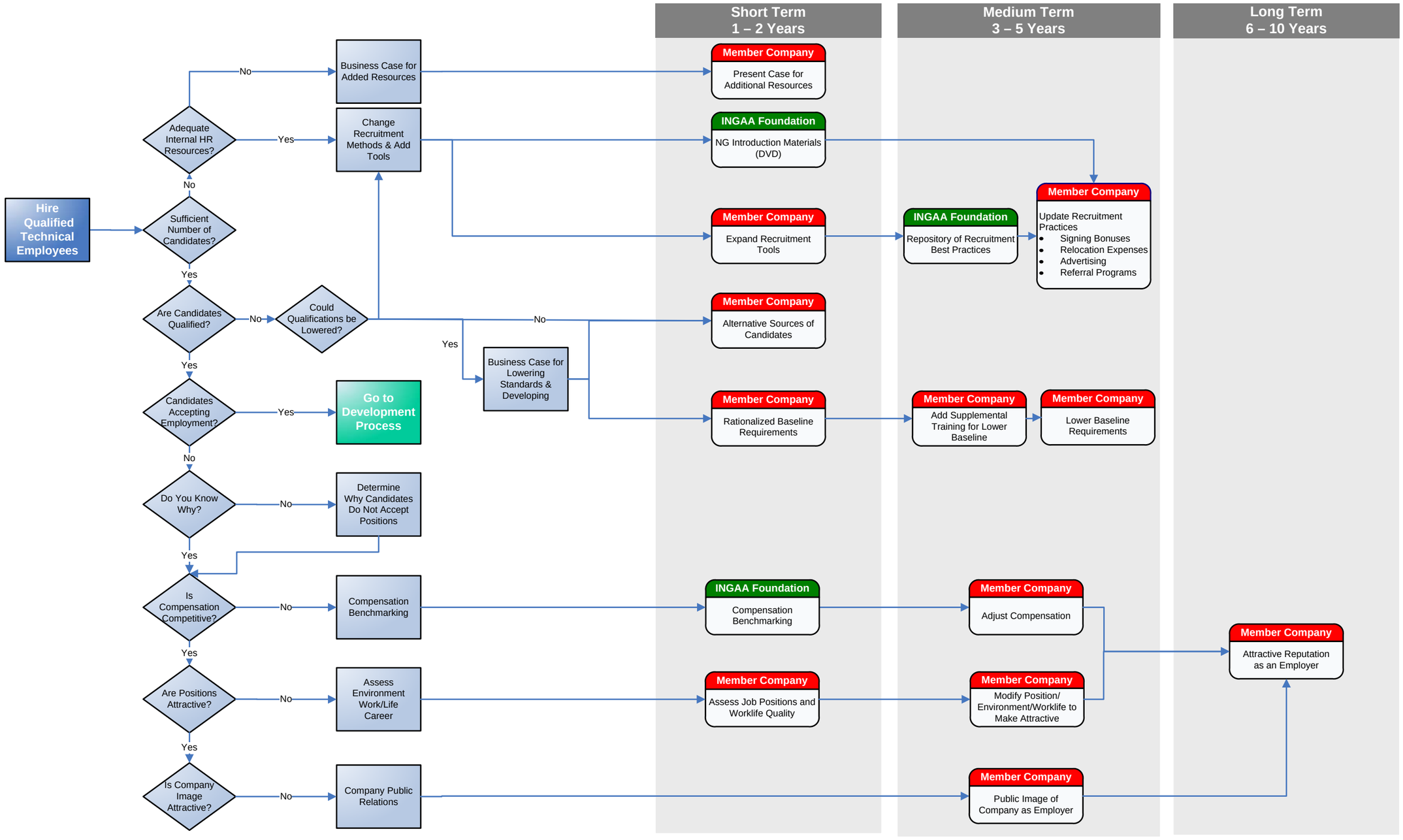
Another way to increase the number of candidates is to structure a lower skilled entry-level position that requires additional training after employment to gain qualification. The additional training can be conducted by the company, contractor, or can be a work/study arrangement with an educational institute. Any changes to the job positions and baseline qualifications should be assessed for total effect and cost based on a potential lower baseline salary, reduced recruitment costs, and increased skill development costs.



RECRUITMENT ROADMAP

The following Recruitment Roadmap is a logic-driven action plan based on the recruitment strategy. Individual companies and the INGAA Foundation should customize the actions based on the assessment of the present situation.

Recruitment Roadmap

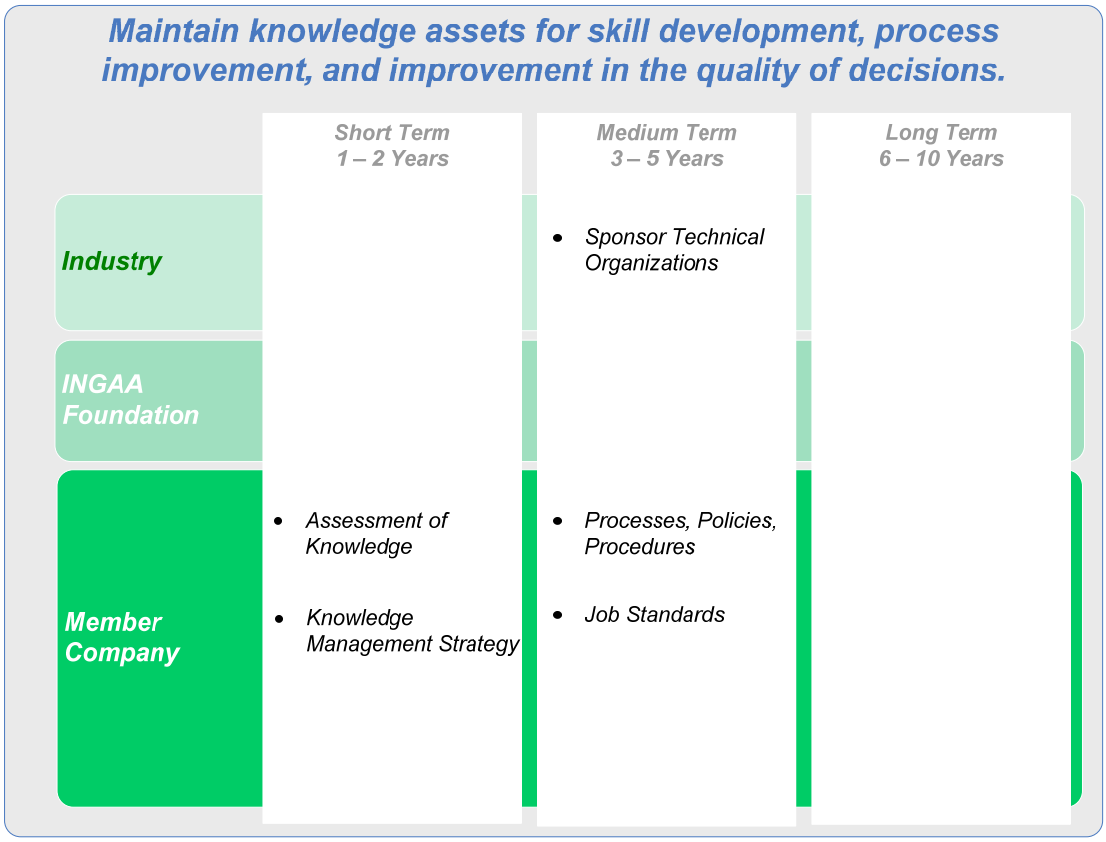


DEVELOPMENT STRATEGY

The goal of the development strategy is to employ effective skill development and knowledge management that maintains the company's knowledge assets for use in preparing new employees for their positions, allowing fully-qualified employees to develop new skills, and supporting corporate-wide operating improvements. The actions are divided into areas of knowledge management and skill development and maintenance.

Knowledge Management

The knowledge management actions maintain the company knowledge for training new employees, process improvement and improving the quality of decisions. The short-term recommendation is for each company to develop a knowledge management strategy. A medium-term goal to ensure that documentation is complete, accurate, and available for the basic knowledge of processes, policies, and procedures. Other medium and longer-term actions will depend on the knowledge management strategy that each company develops. The industry as a whole can sponsor technical organizations that encourage sharing of knowledge among industry experts.

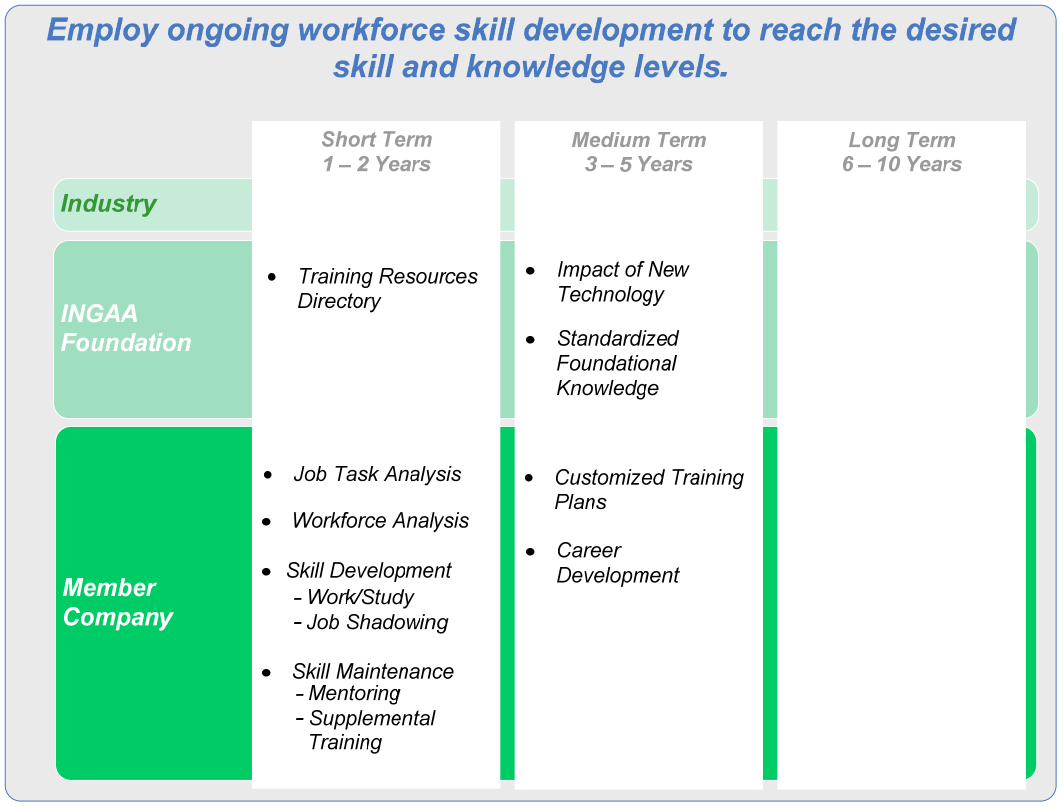


Skill Development

Most of the recommended skill development actions are internal to member companies. The first step of the development roadmap is ensuring the company has detailed information about the job tasks and knowledge requirements for each technical position. This ensures effort is not wasted in skill development or knowledge management for tasks that are not part of the employees' responsibilities. The present skill levels are compared to the desired skill level to determine the gaps and prioritize training plans.

Member companies can increase job skills through job shadowing and work/study programs in the short-term, and delivering customized training curriculum in the medium-term. Maintaining job skills may require additional supplemental training and mentoring in the short-term, and career development in the longer term.

The short-term recommendation for the INGAA Foundation is to maintain a directory of training resources for specialized skill development; the medium-term recommendations are to develop a standardized curriculum of foundational knowledge and assess the impact of new technology on skill requirements.



Development Roadmap

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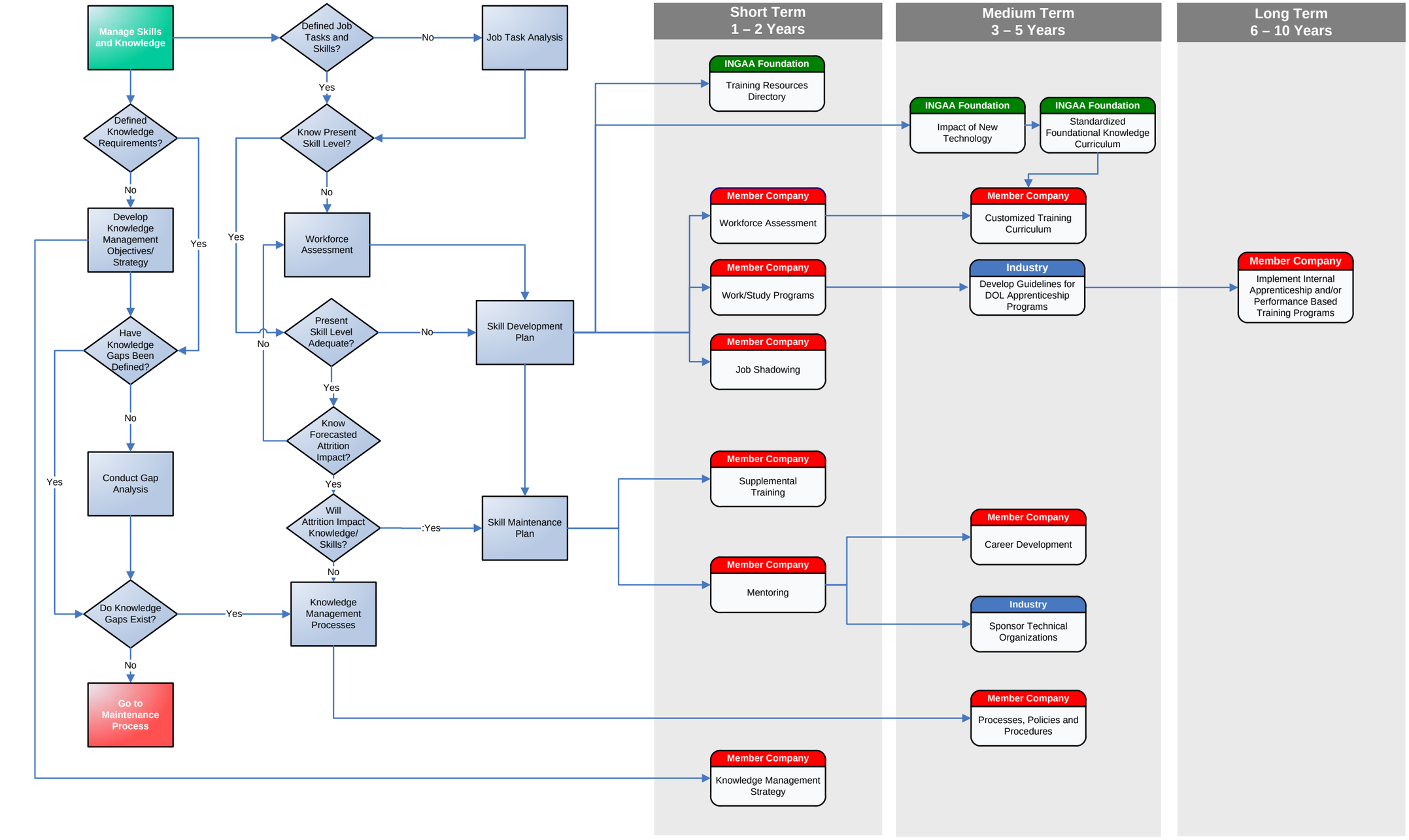
Development Roadmap



MAINTENANCE STRATEGY

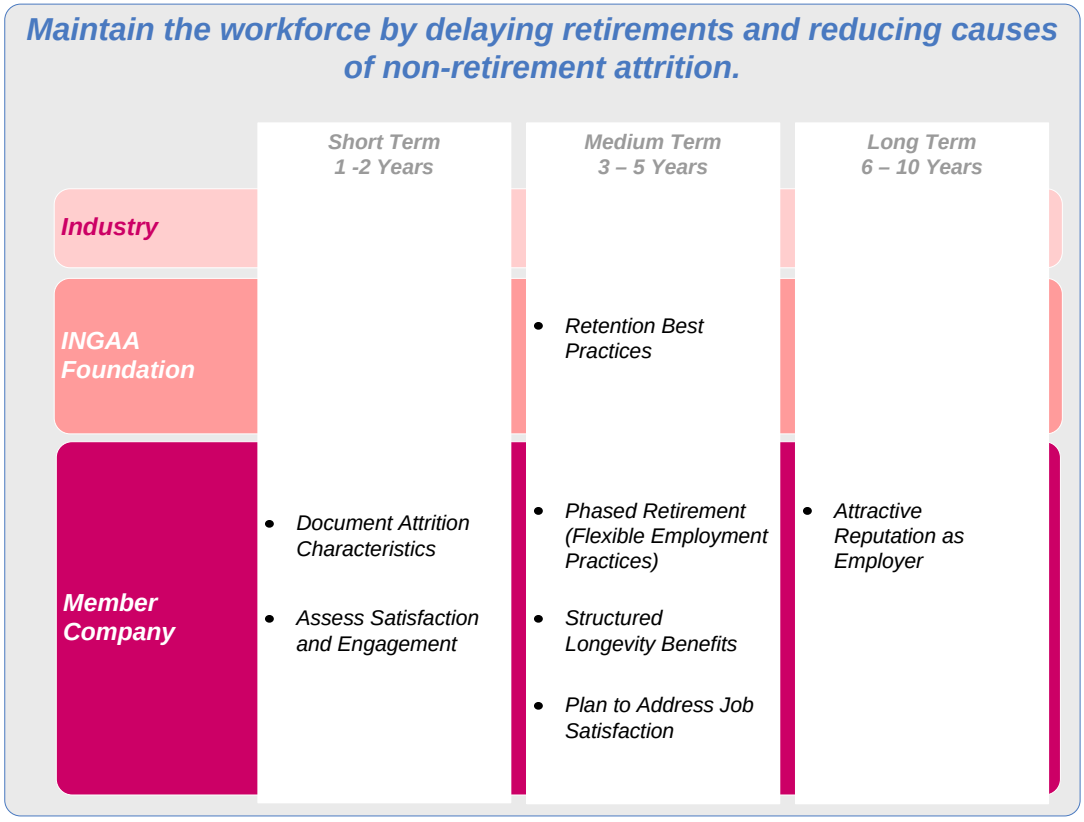
The maintenance strategy involves retaining skilled employees by managing attrition and motivating employees by increasing job satisfaction and engagement. Many of the actions that will retain and motivate employees will also be beneficial in attracting new employees.

Attrition

Retirement and non-retirement attrition can both be addressed by the same methods of increasing job satisfaction and structuring longevity benefits. The initial step is gaining a better understanding for both types of attrition by answering these questions:

- What is your level of retirement and non-retirement attrition?
- What immediate changes in policy would motivate potential retirees to delay their retirement? Should other policies be changed to delay future retirements?
- How satisfied are the employees? What are the causes of dissatisfaction? What changes will address these causes?

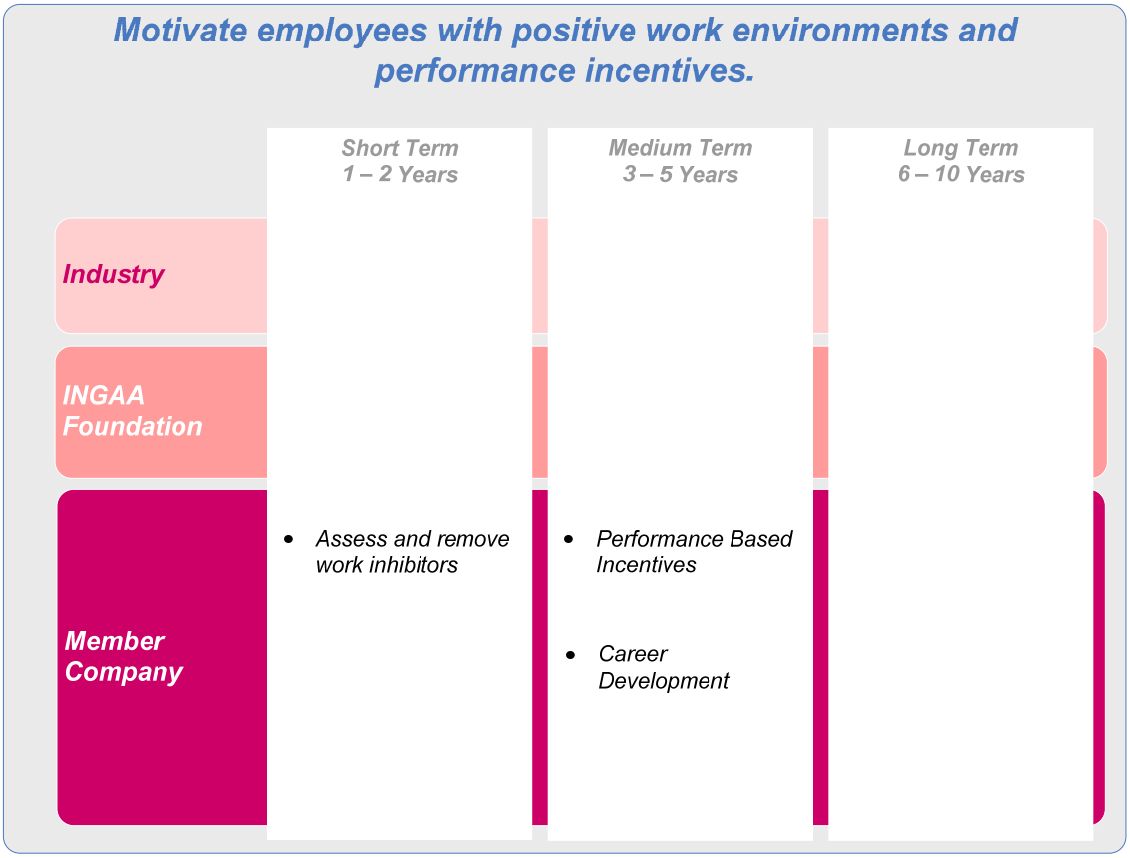
The answers may vary by age and job classification.



Motivation and Engagement

Many of the actions that increase retention will also improve employee motivation and engagement. Skill and career development, fair compensation, and good company reputation are motivating factors that are already being addressed by other strategies. For younger workers, performance-based incentives and career development opportunities are motivators and also help attract new employees. All workers benefit from removing work inhibitors, such as unnecessary bureaucracy, inadequate resources, and limited authority.

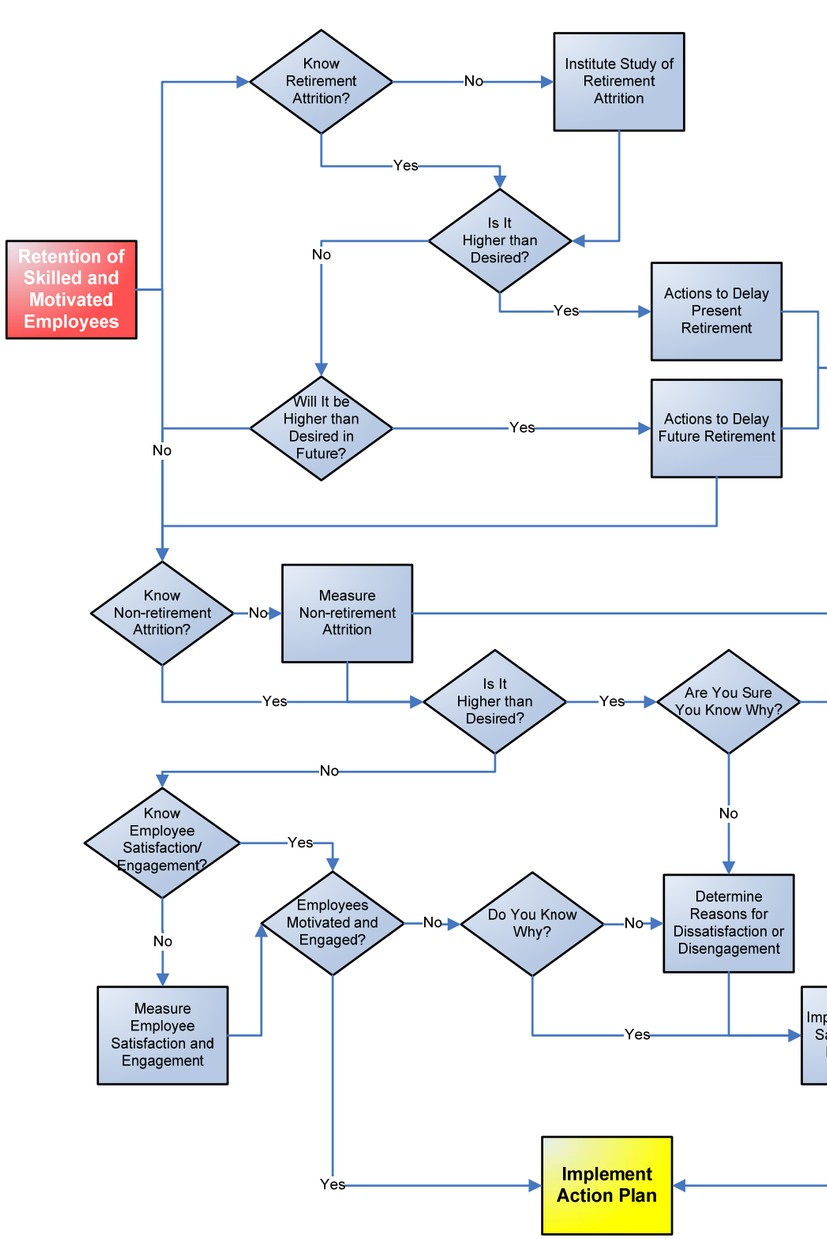
A short-term company action is to assess and begin removing work inhibitors. Medium-term recommendations are making career development and performance-based incentives available, particularly for lower-level employees.



MAINTENANCE ROADMAP

The following Maintenance Roadmap is a logic-driven action plan based on the maintenance strategy. Individual companies and the INGAA Foundation should customize the actions based on the assessment of the present situation.

Maintain Roadmap



Short Term 1 – 2 Years	Medium Term 3 – 5 Years	Long Term 6 – 10 Years
INGAA Foundation Study Retention Practices and Phased Retirements	**Member Company** Structured Longevity Benefits	
Member Company Alternate Employment Practices		
Member Company Assessment of Non-Retirement Attrition		
Member Company Employee Satisfaction and Engagement Assessment	**Member Company** Action Plan to Address Employee Satisfaction • Career Development • Performance Based Incentives • Succession Planning • Compensation	**Member Company** Attractive Reputation as an Employer

VI. NEXT STEPS

This report and roadmap complete the INGAA Foundation Workforce Strategy Phase I project. Key findings show that the workforce issues facing the industry are causing concern among company managers, and these issues are only expected to worsen over the next five years. Only three percent of managers are "very confident" of their company's ability to maintain their workforce and knowledge assets. The areas most at risk for adversely impacting company operations are:

- Resources for workforce planning and action
- Supply of experienced natural gas engineers
- Knowledge management
- Skill development for new and existing employees
- Non-retirement attrition

The recommendations include several follow-on activities for the INGAA Foundation.

- Communicate with executives about this study and the resulting strategies.
- Coordinate efforts to increase the supply of technical candidates for employment.
  - Develop an industry workforce plan that identifies and prioritizes specific skills by aggregating member companies' workforce plans.
  - Communication with the Department of Labor and make use of their available resources, focusing on critical skill shortages.
  - Develop a strategy to educate career counselors about the industry.
  - Develop scholarship guidelines.
- Serve as an information repository and resource to membership.
  - Compensation benchmarking
  - Recruitment best practices
  - Training resources directory
  - Retention best practices and phased-retirements
  - Standardized foundational knowledge curriculum

A coalition of industry groups should work together to:

- Develop a media marketing campaign.
- Standardize curriculum.
- Sponsor technical forums that encourage sharing of knowledge.

The hardest and most important step is to get the industry “on board” to take action. Tackling these tough workforce issues will require a concerted, united effort on the part of the INGAA Foundation, other industry organizations, and individual companies willing to face the critical issues, commit the necessary resources – and do something about these pressing problems.

APPENDIX A – EXECUTIVE INTERVIEWS

PURPOSE

The purpose of the executive interviews was to gain the perspective of workforce issues from executives in the natural gas transmission industry. The executive interview script questions were a starting point to explore the criticality of workforce issues -- one of the top concerns in the transmission industry -- and expected trends. Also of interest was the extent of workforce planning, critical missing information, and the expected role of the INGAA Foundation.

METHODOLOGY

Interviews were conducted using the executive interview script shown in the following section. The order of questions may have changed and some omitted, depending on the interviewee's responses to prior questions. The interviews were conducted over the phone, from February 12 through March 9, 2007.

Twenty-one executive interviews were conducted with INGAA Foundation members from these areas of the transmission industry:

- Construction – 3 interviews
- Manufacturing – 5 interviews
- Pipelines – 6 interviews
- Consulting and other services – 7 interviews

All interview data were aggregated by sector and kept anonymous. Comments were edited only for brevity, clarity, and to retain anonymity without changing the tone or meaning.

INTERVIEW SCRIPT

1. Think about the most important issues/challenges facing the natural gas transmission industry. What are the most critical issues in the short-term? The medium-term? The long-term?

2. Statement: Consider the issues of impending baby-boomer retirements and competition for workforce from other industries, especially in the energy sectors, and their potential impact on your workforce and knowledge assets.

3. Where do programs addressing workforce and knowledge strategies fall in importance within your company?

4. How do you rate safeguarding your workforce and knowledge assets on the following scale?

Very Critical

Workforce and knowledge issues are a very high priority for my company and receive considerable attention in executive meetings. These issues are being addressed and ample resources have been allocated.

Critical

Workforce and knowledge issues are a priority for my company and receive attention in executive meetings. These issues are being addressed and receive additional resources when required.

Normal Importance

Workforce and knowledge issues are of normal importance for my company and receive the same attention and resources they have received over the last several years.

No Opinion

Workforce and knowledge issues are handled at a lower level of the company and do not receive visibility at the executive level.

5. Do you view knowledge management and workforce as the same issue?

6. Who is responsible for knowledge management or workforce strategies in your company?

7. Do workforce issues present a material risk to meeting your company's goals (profitability, growth, project deadlines)? If so, how do you quantify the risks and what are their expected impacts on your company's recruiting, retention, attrition, knowledge assets and succession planning?

8. What are your observations of actions the industry or your company are taking at present to address the workforce issues?

9. What is the ideal that the industry or your company is working towards when addressing these issues?

10. What information are you lacking that would help the industry leaders or your company address these issues?

11. Are there any other tools or changes that the industry or your company need in order to address these concerns?

12. What actions should the INGAA Foundation take to help mitigate these risks on behalf of the industry or your company?

13. Do you feel your company or the industry will be able to successfully mitigate these risks? Please use the following scale.

Very Confident

These issues receive high visibility in the company (industry), and have been addressed in a comprehensive manner. The risks have been quantified, adequate resources have been allocated, and a plan is being implemented according to schedule.

Confident

These issues receive visibility within the company (industry), and have been addressed. The most important risks have been quantified, some resources have been allocated, and necessary steps are being taken.

Somewhat Confident

These issues have some visibility in the company (industry), and actions to address them are in the planning stages.

No Opinion

These issues do not have visibility at the executive level of the company (industry).

EXECUTIVES' TOP ISSUES

Regulatory issues were the main concern of the natural gas pipeline executives interviewed. This was followed by workforce and resources constraints.

- Regulatory
  - Carbon and greenhouse emissions
  - Rate cases that allow ROI
  - Changing regulations
- Workforce and knowledge shortages
- Resource shortages
- Competition
- Industry leadership

Workforce and Knowledge Issues

- Cyclic nature of employment deters people from industry; few drivers to bring people into the industry (lacks appeal).
- Challenged with replacing and training new employees to meet demands.
- Companies are recruiting from within the industry, adding to non-retirement attrition.

- Workforce costs are rising as companies are “throwing money” at candidates to fill positions.
- Service organizations are potentially becoming unable to support clients to the level needed.
- Knowledgeable and skilled employees are leaving and there are few strategies for preventing knowledge loss.
- Fewer students are choosing technical educations.

Material and Equipment Issues

- Inability to access raw materials
- Equipment aging and struggle to maintain equipment
- Equipment shortages

WHAT’S AT RISK?

- Foreign companies coming into the market
- Reduced market share
- Reduced credibility and sales volume; turning down of projects
- Reduced margins
- Price wars; volatility of pricing on projects
- Inability to deliver on time
- Continually rising manpower costs

WHAT’S CURRENTLY BEING DONE?

- Increasing wages and consulting fees
- Recruiting from colleges, other industries, and ex-military
- Creating alliances with colleges; providing grants
- Pushing unions to train
- Using “buddy systems” to train pipeline workers
- Global resourcing and partnering
- Career development and retention programs

SUPPORT NEEDED FROM INGAA AND INGAA FOUNDATION

Forecasting and Planning

- Help forecast project opportunities and resources.
- Provide/lead forums to collaborate on issues.
- Conduct a study that shows the size and cost of these issues.
- Help with long-term forecasting and recommendations on what is needed.

Industry Promotion

- Develop a marketing plan for the industry and produce a standard, professionally produced orientation program for the industry.
- Develop a campaign to promote sciences, engineering, and trades in high schools and colleges.

Resource Issues

- Help members obtain pipeline resources abroad; assist with immigration and visa issues.

Training

- Develop an educational program or provide directory of resources.
- Assist with training grants or government subsidies.
- Develop consistent industry standards to reduce training costs.
- Work towards standardized Operator Qualifications.

Regulatory

- Meet with FERC to relax construction schedules.

SAMPLE COMMENTS

Think about the most important issues/challenges facing the natural gas transmission industry. What are the most critical issues in the short term? The medium term? The long term?

Pipeline companies' responses:

- Regulatory (7 comments)
  - Carbon and greenhouse emissions (3)
  - Rate cases that allow ROI (2)

  - Changing regulations (1)
  - Integrity management regulations (1)
- Workforce (6)
  - Availability of skilled labor (4)
  - Increasing costs (2)
- Resources to support volume of projects (4)
  - Equipment (2)
  - Materials (1)
  - General resources (1)
- Changing Industry (1)
  - Future gas supply (1)

Service providers' responses:

- Resources to support volume of work (14)
  - Forecasting and planning (5)
  - Construction boom (3)
  - Equipment (3)
  - Materials (2)
  - Capital (1)
- Workforce and knowledge (13)
  - Workforce (9)
  - Skills (2)
  - Attrition (1)
  - Knowledge management (1)
- Regulatory (6)
  - Compliance with DOT (1)
  - Climate change (1)
  - Comprehensive energy policy (1)
  - Speed of approvals (1)
  - General regulatory (2)

- Competition (6)
  - Other fuels (3)
  - Foreign supply of natural gas (1)
  - Inter-industry (1)
- Changing industry (6)
  - Industry leadership in changing times (2)
  - Effects of LNG (2)
  - Gas supply (1)
- Public and political (5)
  - Landowners (2)
  - NGOs (1)
  - Public perception of industry (1)
  - Politics of implementing global solutions (1)
- Revenue (3)
  - Variability in pricing projects (2)
  - Sustaining profitability (1)

How important are workforce and knowledge management programs in your company?

- Pipeline (sample comments)
  - Number one is people; we are hiring from our competition.
  - For us it is one of the strategic initiatives for the entire company. It's a line item in the five-year plan.
  - This is high on radar screen, but does not get to board level.
  - It's up there with safety and profitability. It's in the top three issues.
  - Training is the number one priority to the operational success of our company.
  - It's a much bigger focus than in the past.
- Services (sample comments)
  - Its huge; it's in the top 5. We compete for talent.
  - Training is the biggest thing.
  - I don't know. Good question. This issue is upon us.
  - It's utmost as far as importance.

Do workforce issues present a material risk to meeting your company's goals?

- Pipeline (sample comments)
  - Margins this year are a big concern, The price war for manpower is happening.
  - It is hindering our ability to grow. We are sustaining through efficiency and technology.
  - The only business we have lost is not being able to put our hands on raw materials, not from people workforce issues.
  - Manpower costs have gone up and are much more of a factor for us. We have not had a problem getting projects completed yet. Have done a lot of lead time hiring, much more than in the past.
  - Reduced market share and sales volume.
- Service (sample comments)
  - There are longer-term reductions in current margins due to costs for training and all the other programs needed just to sustain present activity. It's a problem because it is a boom time and the margins are low.
  - We turned down $10M in projects last year.
  - Our sales and growth goals are down.

What actions are being taken in your company and industry to address the workforce issues?

- Pipeline (sample comments)
  - As an industry working together there has been some discussion about cooperative agreements.
  - We have alliances with colleges.
  - We are pushing the unions to train. Then we will have to use the buddy system to train the pipeline workers.
  - Seems to be a lot of increase in college recruiting; looking in other industries; engineering jobs are being taken overseas.
- Service (sample comments)
  - Throwing money at them. Whatever is the maximum of what the market will bear for salaries.
  - With all the mergers and acquisitions that took place, a lot of the senior leadership is gone.

What ideal is your industry/company working towards when addressing workforce issues?

- Pipeline (sample comments)
  - This is an awareness issue. The career path should be promoted. Create pride and job satisfaction.
  - We should pool resources for the overall benefit of the industry.
  - Collaboration. How do we ensure the industry is healthy ten years from now?
  - The industry should create standard curriculums based on skills needed in the future.
  - Managing the cyclical workload.
  - Address our industry public relations issue for the long term.
- Service (sample comments)
  - The industry can prioritize projects.
  - Create a right-sized industry.
  - The ideal would be more children in science education.
  - Develop national strategies that are consistent with the energy policy.
  - Standard curriculums.

Do you view knowledge management and workforce as the same issue?

- Pipeline (sample comments)
  - No, our strategy is that we look for the willing and versatile.
  - We have knowledge management programs. We support certifications, and ask our people to work and go to school.
  - Our safety department handles training. Process improvement is not really an issue; we stick with the tried and true.
  - The knowledge management is the work processes. This must be managed as a long-term issue.
  - Knowledge management is employee development.
  - No, knowledge transfer is the responsibility of us in middle management.
  - Knowledge management is when people are trained as well as they can be.
  - This is different. Tacit knowledge is of great concern.
- Service (sample comments)
  - Yes, knowledge management and workforce are all part of the same piece. The costs associated with this are huge. It's an investment that no one has time for in the

middle of the boom. No one understands this infrastructure. It is more than just process and knowledge capture – it's a culture change.

- Yes, otherwise you are looking at workforce too simplistically.
- They are tied together. We are investing in a lot of entry-level people and accelerating their development. They would never replace a 30-year retiree, but we realize we must build the base of the pyramid to select a fast track.

What information is you lacking that would help the address these issues?

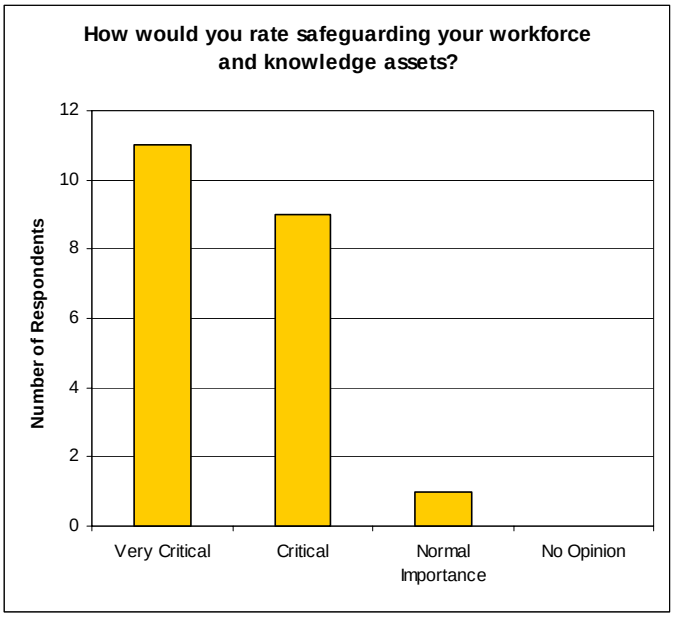
- Pipeline (sample comments)
  - How do we attract people to the market?
  - The information is there; it's taking the information and using it.
  - The information that is lacking is a clear picture of the skills needed in future and then a plan for these.
  - Lacking knowledge on how to address the problem.
  - Nothing – Human resources is on top of it now.
  - We need data about what educational programs exist so we can assess the gaps and fill them.
  - Workforce availability by sector and trade.
- Service (sample comments)
  - Forecasts for years out to assist in managing future workforce peaks and valleys.
  - Lessons learned from other industries.
  - Show impact of stealing from each other which does not build the pool.
  - All the associations should publish the list of available training resources.

What would help you manage the problem?

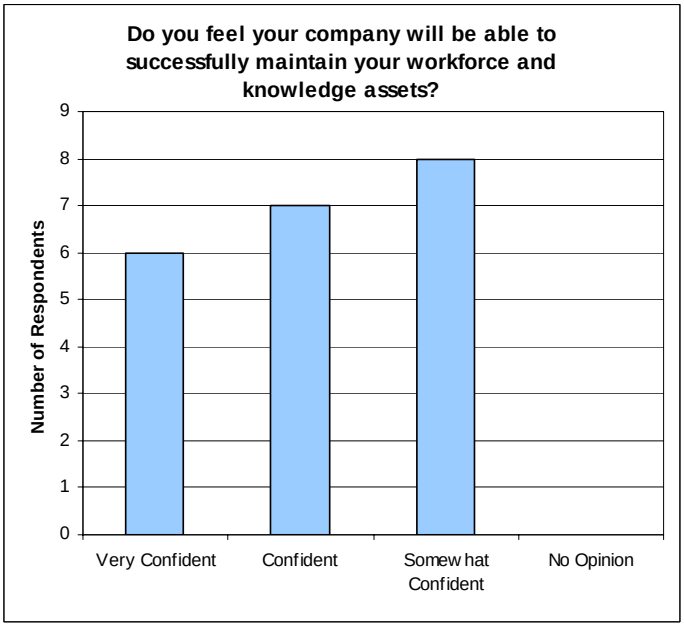
- Pipeline (sample comments)
  - The tools are there; use the lobbyists, use the media, stop the self interest.
  - Involve our customers in the solution.
  - Educate consumers on energy policy, the cost of fuels, and the importance to our national position.
  - Common operator qualifications for the industry.
  - Training and awareness of this issue for the managers.
- Service (sample comments)
  - Help us do more to attract people into the pool.

- Help us with visa issues and attracting international pipeline talent into the US.
- We have tools to understand the workforce shortage; we are collecting metrics to manage globally.
- I would challenge the industry leaders to help us plan and forecast and show the industry we can give our workers 11 months of work in a year, not six or seven.

How do you rate safeguarding your workforce and knowledge assets on the following scale?



Do you feel your company or the industry will be able to successfully mitigate these risks?



APPENDIX B – MANAGEMENT ONLINE SURVEYS

SURVEY METHODOLOGY

Three surveys were developed to gather information from managers in the natural gas transmission industry. The surveys were completed online and though paper submissions by a total of 70 participants during February and March of 2007, with respondents from three areas:

- Human Resources – 15 respondents
- Technical and Operations – 26 respondents
- Other Managers – 29 respondents

Companies represented were:

- Pipeline – 33 respondents
- Consulting – 19 respondents
- Construction, Manufacturing, Other Services – 18 respondents

All survey results were collected anonymously.

The survey topics were:

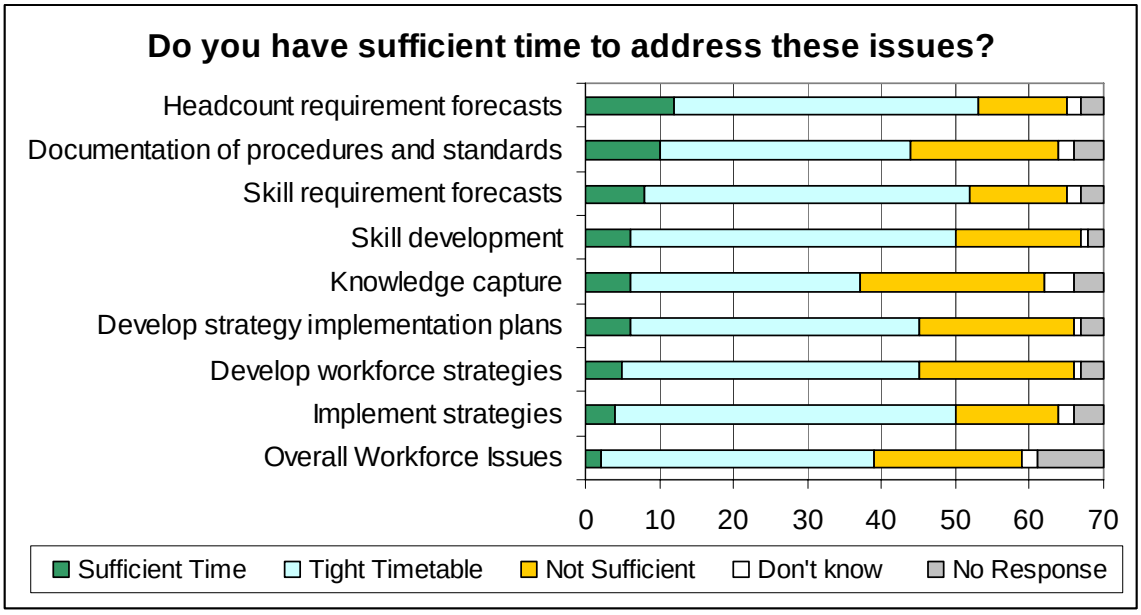
- Human Resources
  - Respondent Demographics
  - General Human Resources
  - Recruiting Methods
  - Applicants
  - Recruiting Results
  - Attrition
  - Compensation and Environment
  - External Education, PR, Lobbying, and Strategies
  - Overall Assessment
- Technical and Maintenance
  - Respondent Demographics
  - Operations, Maintenance and Technical
    - Workforce
    - Skill Development
    - Knowledge Management

        - General Management
    - Compensation and Environment
    - External Education, PR, Lobbying, and Strategies
    - Overall Assessment
- General Management
    - Respondent Demographics
    - Workforce and Knowledge Management
    - Compensation and Environment
    - External Education, PR, Lobbying, and Strategies
    - Overall Assessment

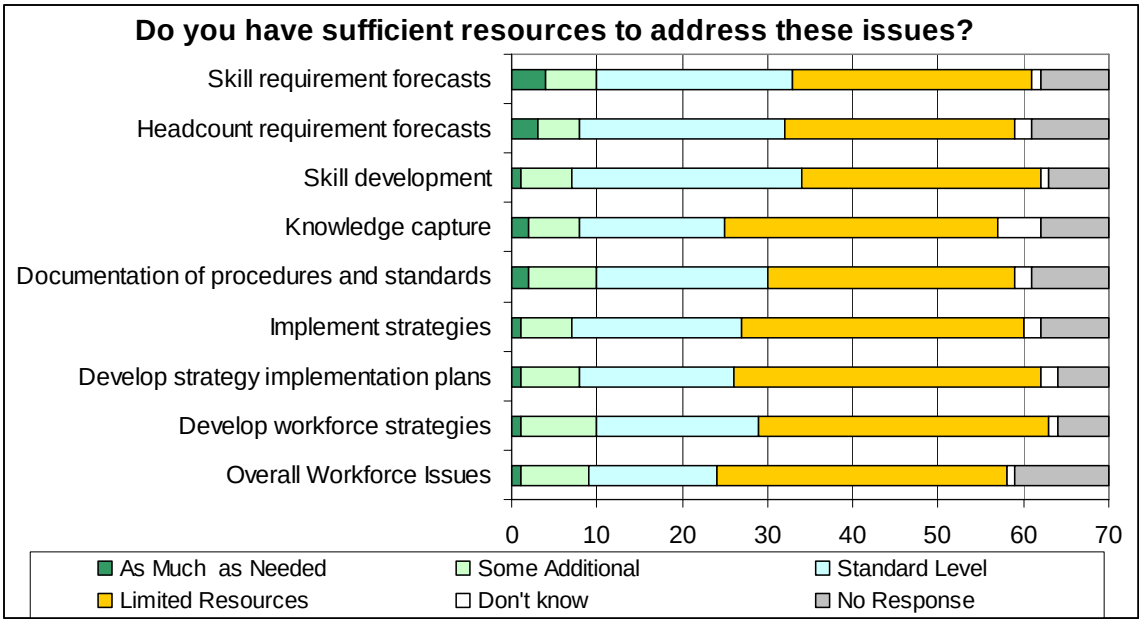
WORKFORCE CRITICALITY AND RESOURCES

A1. Do you have sufficient time and resources to address these workforce and knowledge management activities?

Do you have sufficient lead time?

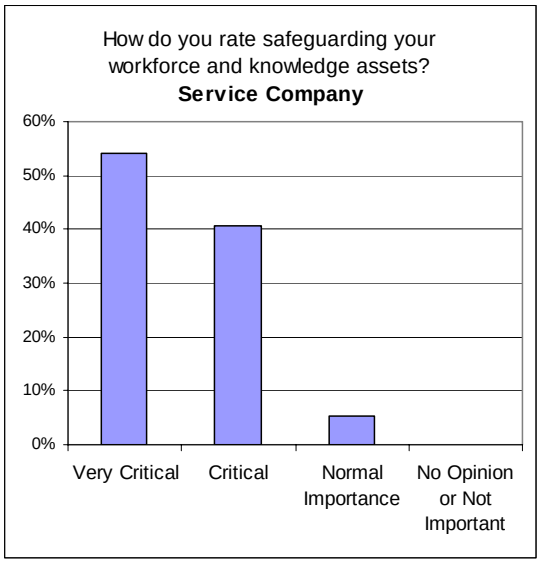


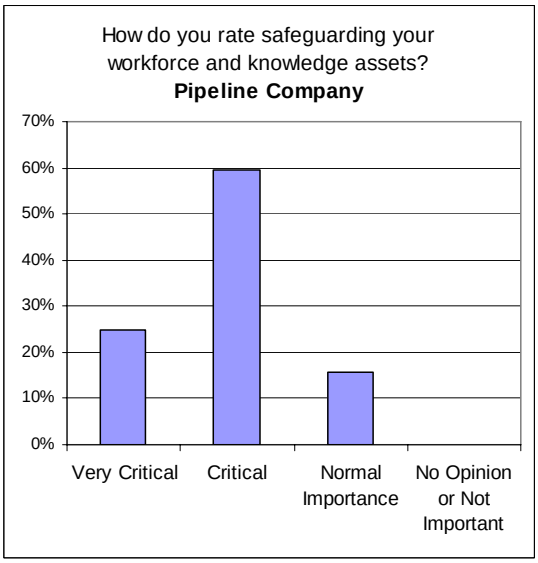
Do you have sufficient resources?



A2. How do you rate safeguarding your workforce and knowledge assets on the following scale?

- Very Critical - Workforce and knowledge issues are a very high priority for my company and receive considerable attention at the upper management level.
- Critical - Workforce and knowledge issues are a priority for my company and receive attention at the upper management level.
- Normal Importance - Workforce and knowledge issues are of normal importance for my company and receive the same attention as they have received over the last several years.
- No Opinion or Not Important - Workforce and knowledge issues are handled in a different area of the company or are not considered important.

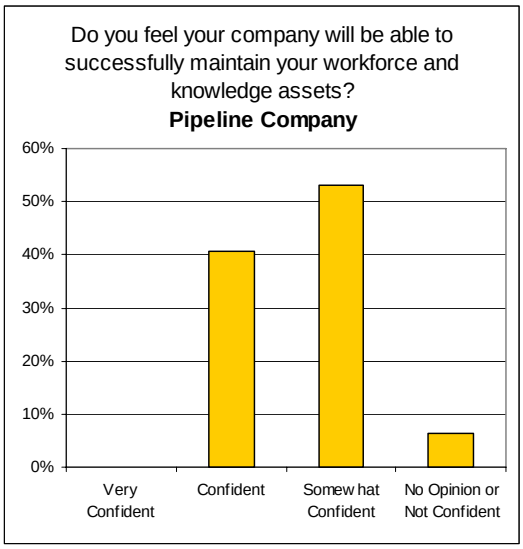




A3. Do you feel your company will be able to successfully maintain your workforce and knowledge assets?

- Very Confident - These issues receive high visibility in the company, and have been addressed in a comprehensive manner. The risks have been quantified, adequate resources have been allocated, and a plan is being implemented according to schedule.
- Confident - These issues receive visibility within the company, and have been addressed. The most important risks have been quantified, some resources have been allocated, and necessary steps are being taken.
- Somewhat Confident - These issues have some visibility in the company, and actions to address them are in the planning stages.

- No Opinion or Not Important - These issues do not have visibility in my area of the company or are not considered important.



HUMAN RESOURCES

RECRUITMENT

H1. How many total technical positions does your company have? 460 (Pipeline) 320 (Services)

H2. How many technical positions are unfilled at present?* 7%

H3. What is the average age of your present technical workforce? Pipeline 46 yrs, Services 44 yrs

H4. Which do you use to benchmark compensation?

- Other transmission companies? 20%
- All employers of similar job classification? 47%
- Other method? 33%

H5. Do you measure employee satisfaction? 33% yes 67% no

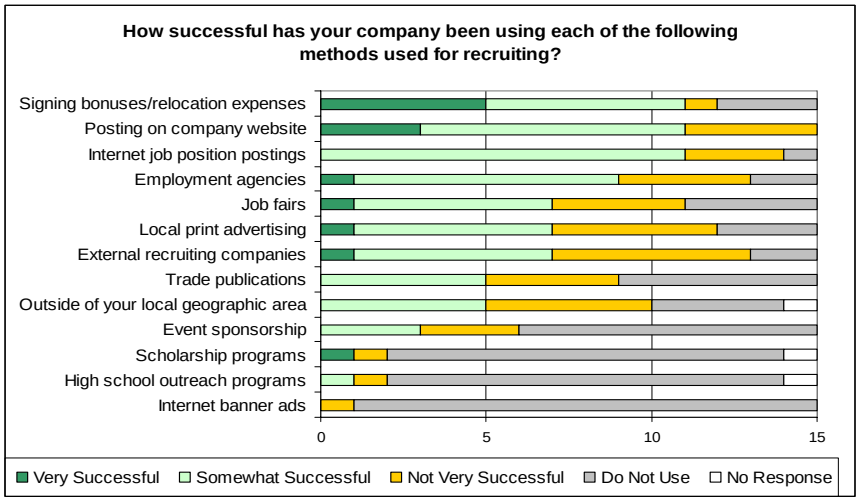
* This question was not included in the online survey. The small sample of hard-copy respondents results in a less reliable average percentage of unfilled technical positions.

H6. If so, what are your present satisfaction numbers and goals?

- We conduct surveys every two years. Current employee engagement ratings are high. We are experiencing very low voluntary turnover as one measure of success.
- Employee opinion survey using approximately 70 questions, including engagement, compensation, recognition, challenging job, business direction, technical excellence, etc. 80% satisfied and goal is 95%.
- Reasonably satisfied, but resource constrained.

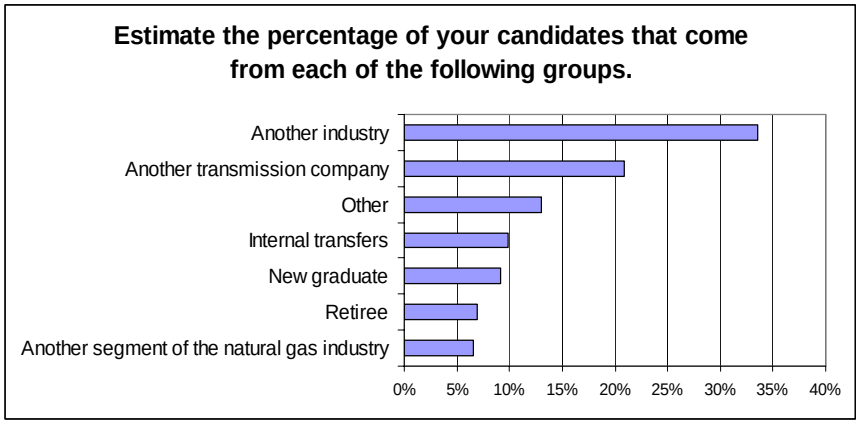
RECRUITING METHODS

H8. How successful has your company been using each of the following methods for recruiting?



APPLICANTS

H9. Estimate the percentage of your candidates that come from each of the following groups:



If "Other", please explain:

- Pipeline service companies
- Walk-ins
- Hires from engineering companies
- Associate referrals
- Information is not readily available since we do not formally track it

H10. What percentage of your applicants meets the baseline skill requirements for their positions? 66%

What method do you use to determine a candidate's skill level?

- Interview (11)
- Testing (4)
- Resume (3)
- Background check for academics and work history (3)
- References (2)
- Transcripts (1)

Do you feel this method is accurate? 87% yes 13% no

If no, why not?

- Difficult to determine from discussion.
- Sometimes it is accurate. Other times, a subjective determination of skills proves inaccurate.
- It is the best method other than testing or on-the-job apprenticing, which we do not do.

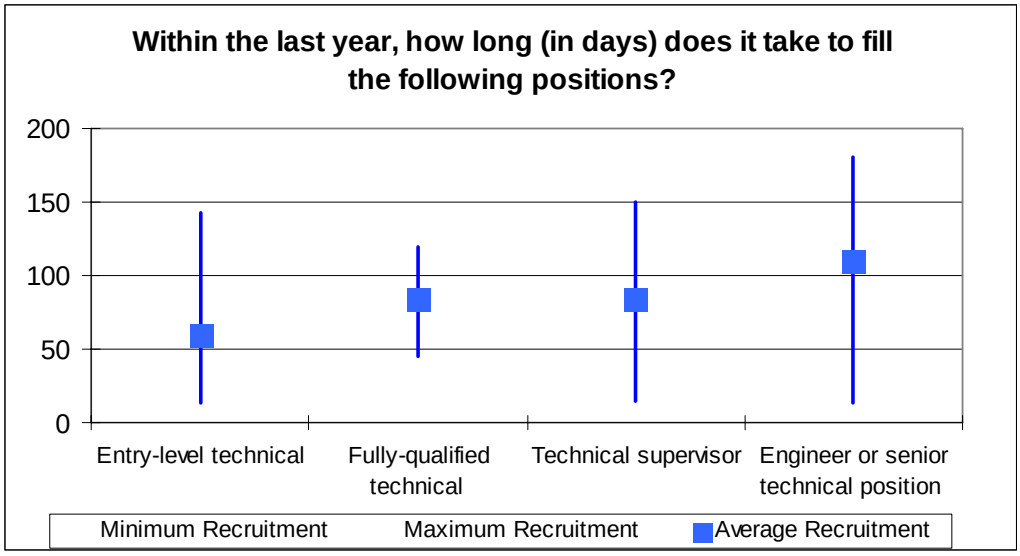
H11. Considering the technical new-hires in your company:

- What percentage is fully-qualified? 79%
- Of the fully-qualified candidates, what is their average applicable years of experience? 7 yrs
- What is the average age of fully-qualified new-hires? 39 yrs

- What is the average age of trainee or apprentice new-hires? 26 yrs
- What percentage of new-hires are contract or temporary employees? 10%

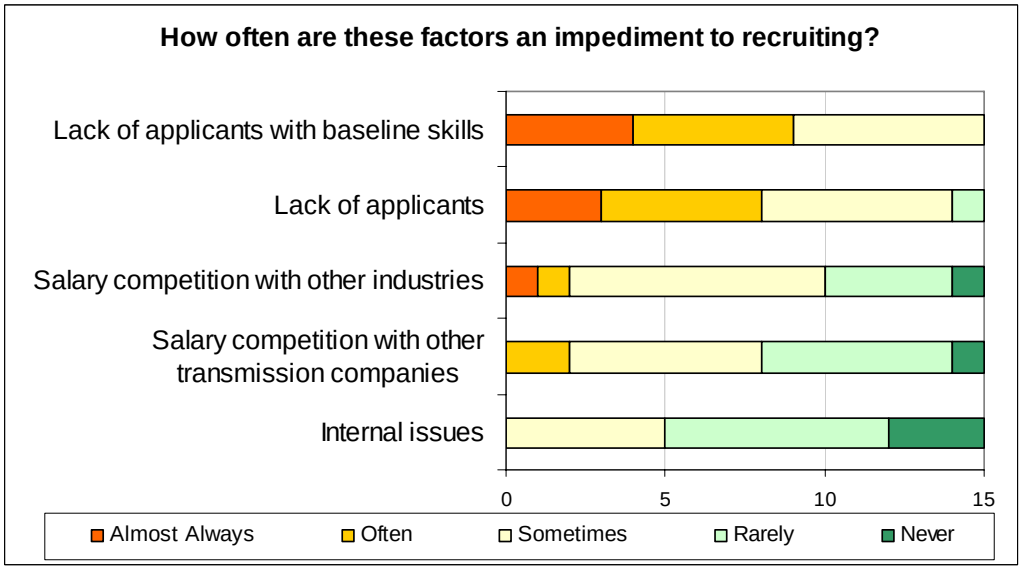
RECRUITING RESULTS

H12. Within the last year, how long (in days) does it take to fill the following positions?



How has this changed over the last five years for each position type? 79 % of respondents reported that this time period has increased over the last five years.

H13. How often are these factors impediments to recruiting?



H14. Do you track the cost for hiring an applicant? 27% yes 73% no

If so, what is the average cost and which factors do you consider for calculating that cost?

- Raw recruiting costs (ads, relocation, signing bonuses) approximates $1,300
- Approximately, 1 year salary. Cycle time, training, recruiting, relocation.
- $1000 to $2000. We use application processing, review and notification, interviewing, drug screening, orientation, material and equipment, and administrative staff.
- Human resources tracks annual costs for background checks, drug testing and advertising for budgetary purposes.

H15. Which are the most difficult positions to fill?

- Engineers (7)
  - Pipeline engineer
  - Senior project engineers
  - Engineering in specialty areas such as friction stir, non-destructive evaluation and plastics
  - Storage and reservoir engineers
  - Engineers with experience in compression and measurement
- Technicians (3)
  - Fully qualified technicians and experienced heavy equipment operators.
  - Electrical and controls technicians and measurement technicians
  - Field technician positions based on geographic location and/or competition for those skills in the current market.
- Senior technical roles (2)
- At present, any position above entry level is a challenge to fill.
- Management
- Energy efficiency consultants
- Rights-of-Way professionals

ATTRITION

H16. What is your present yearly non-retirement attrition? 9% (Pipeline) 13% (Services)

How do you expect that number to change over the next two years?

- Increase (5 responses)
- No change (4 responses)
- Decrease (3 responses)
- Don't know (1 response)

How do you expect that number to change over the next five years?

- Increase (7 responses)
- No change (3 responses)
- Decrease (2 responses)
- Don't know (1 response)

H17. Do you have a non-retirement attrition goal (limit)? 13% yes 87% no If so, what is it? 6%

H18. What is your present yearly retirement attrition? 1.7% Pipeline, 2.4% Services

How do you expect that number to change over the next 2 years?

- Increase (10 respondents)
- No significant change (3 respondent)

How do you expect that number to change over the next 5 years?

- Increase (12 respondents)
- Decrease (1 respondent)

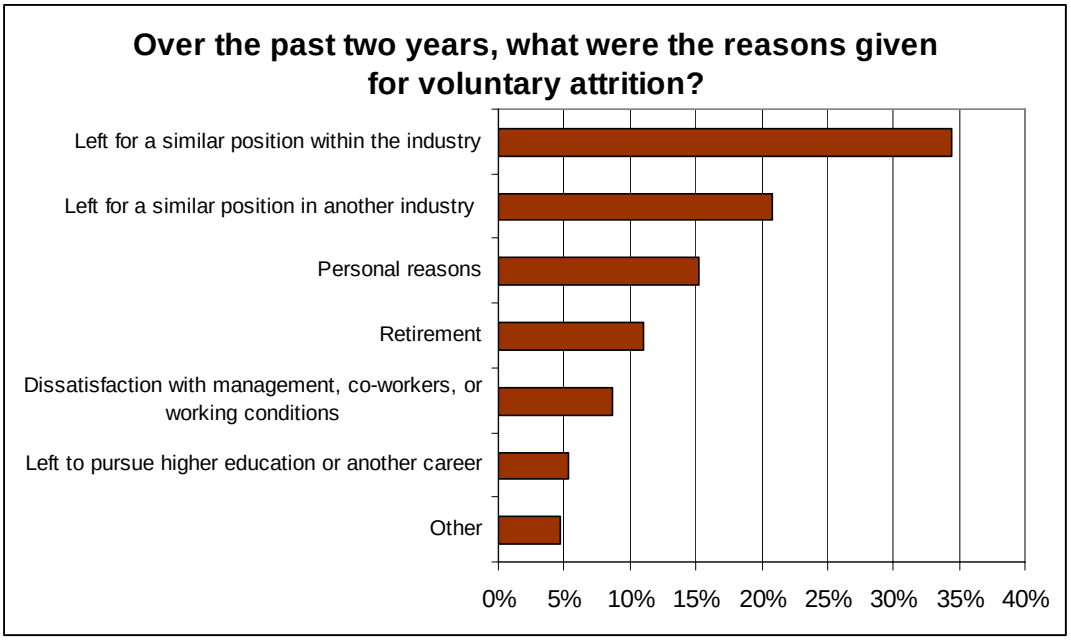
H19. What are the minimum (55 yrs), median (62 yrs), and maximum (66 yrs or no limit) retirement ages in your company?

Do you expect them to change? 0% yes 100% no

If yes, please explain.

H20. Do you conduct exit interviews? 100% yes
Do you feel they are accurate? 100% yes

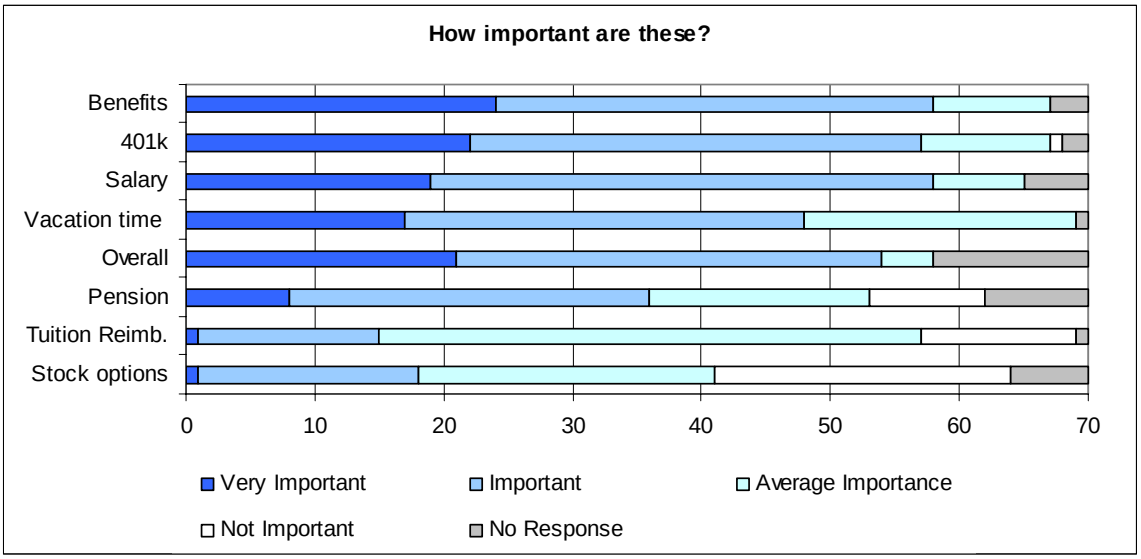
H21. Over the past two years, what were the reasons given for voluntary attrition? Estimate the percentage in each category:

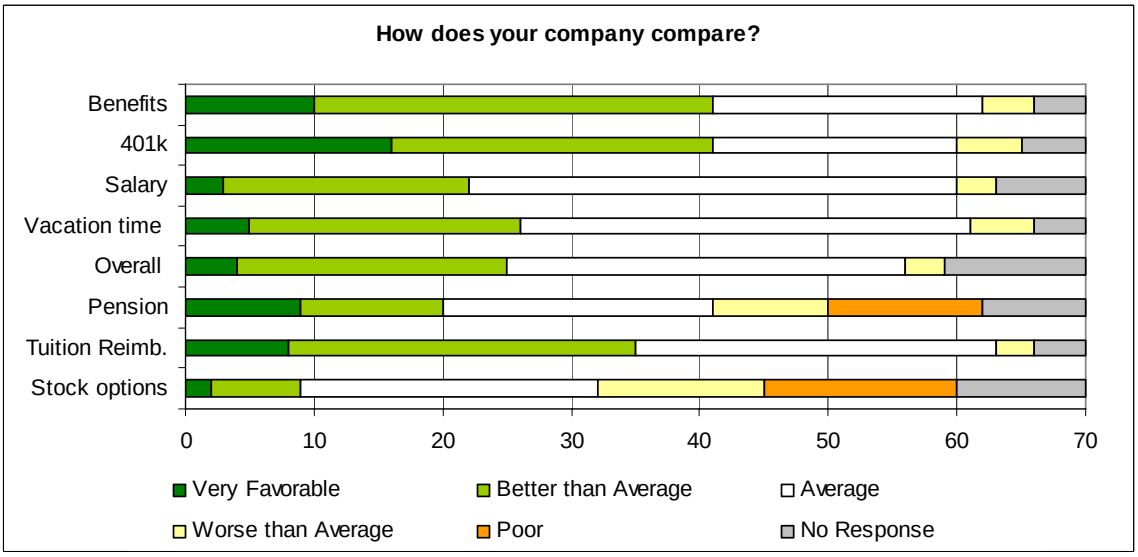


COMPENSATION, CAREER AND ENVIRONMENT

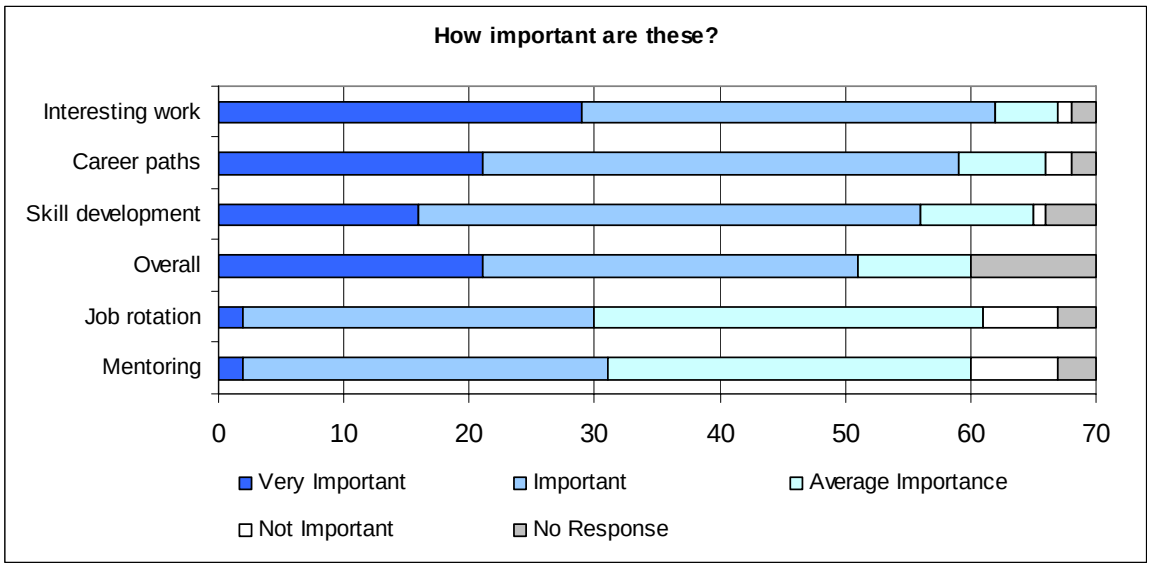
A healthy and engaging work environment is vital to employee recruiting and retention. How important are the following factors to your company? How does your company rate in comparison to others (inside or outside the transmission industry) that hire similar skill sets?

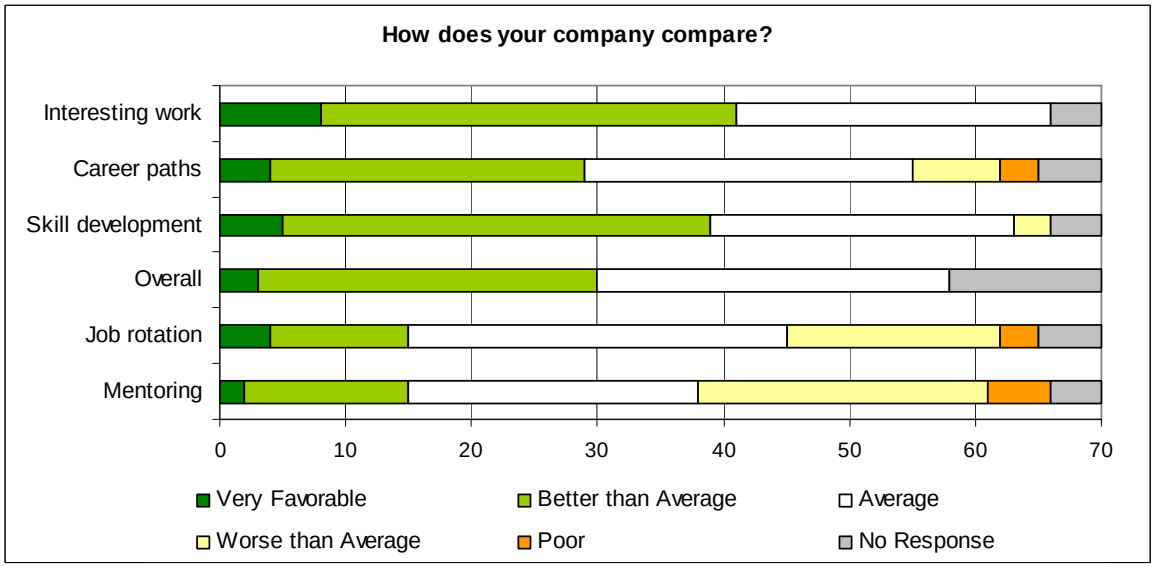
COMPENSATION



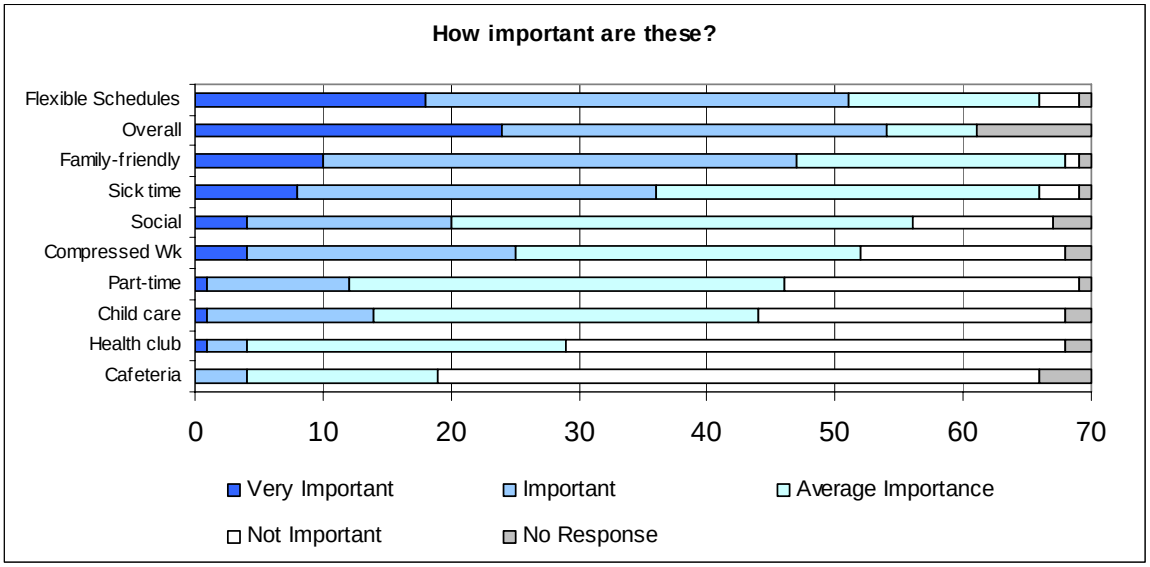


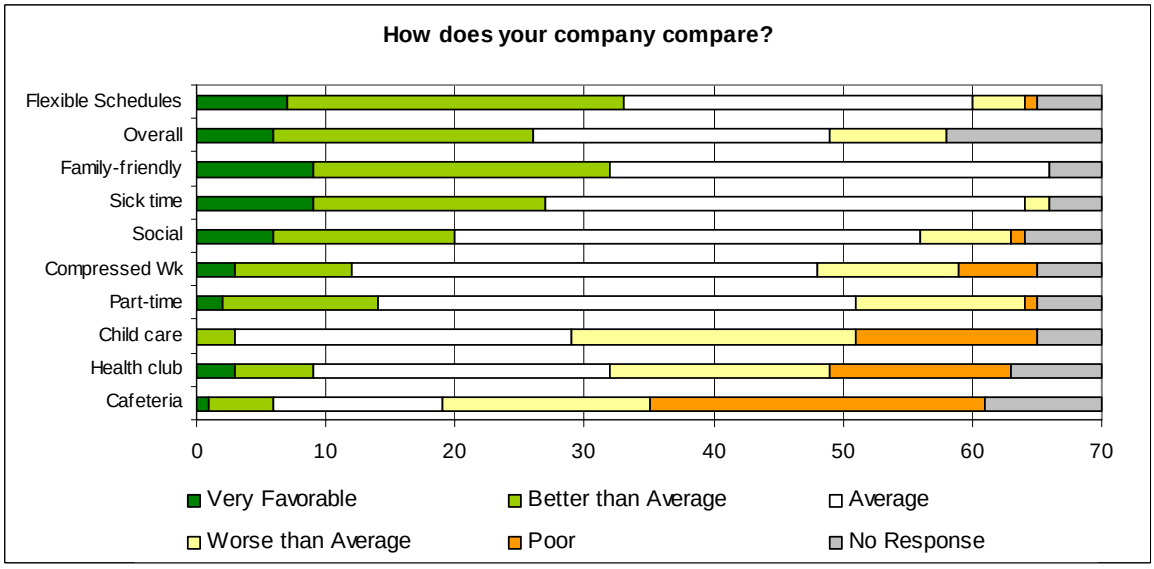
CAREER


How important are these?
Interesting work
Career paths
Skill development
Overall
Job rotation
Mentoring
0
10
20
30
40
50
60
70
Very Important
Important
Average Importance
Not Important
No Response

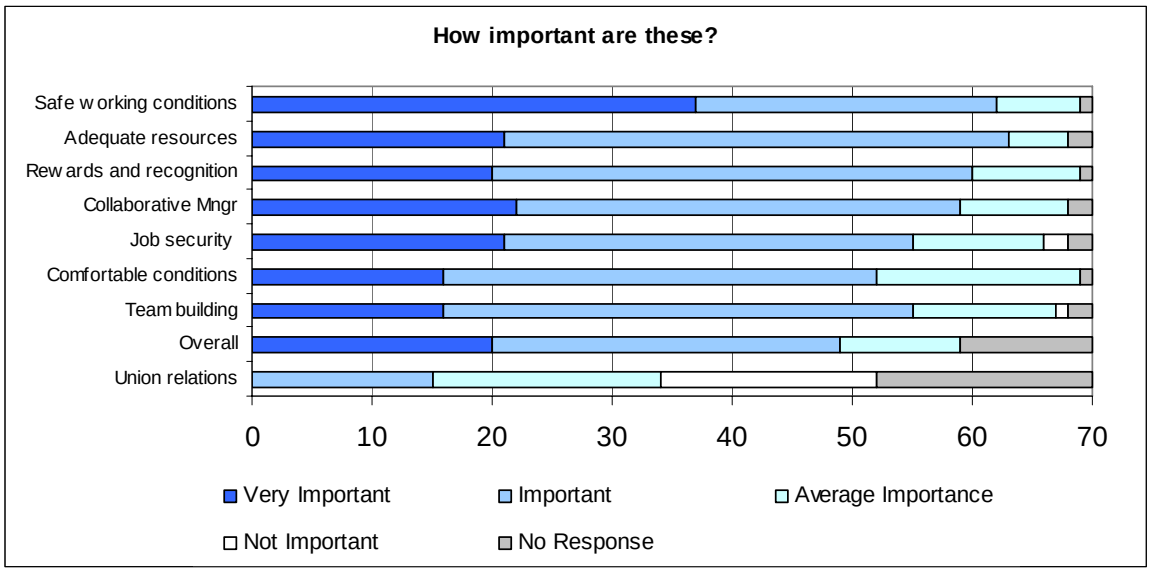

How does your company compare?
Interesting work
Career paths
Skill development
Overall
Job rotation
Mentoring
0
10
20
30
40
50
60
70
Very Favorable
Better than Average
Average
Worse than Average
Poor
No Response

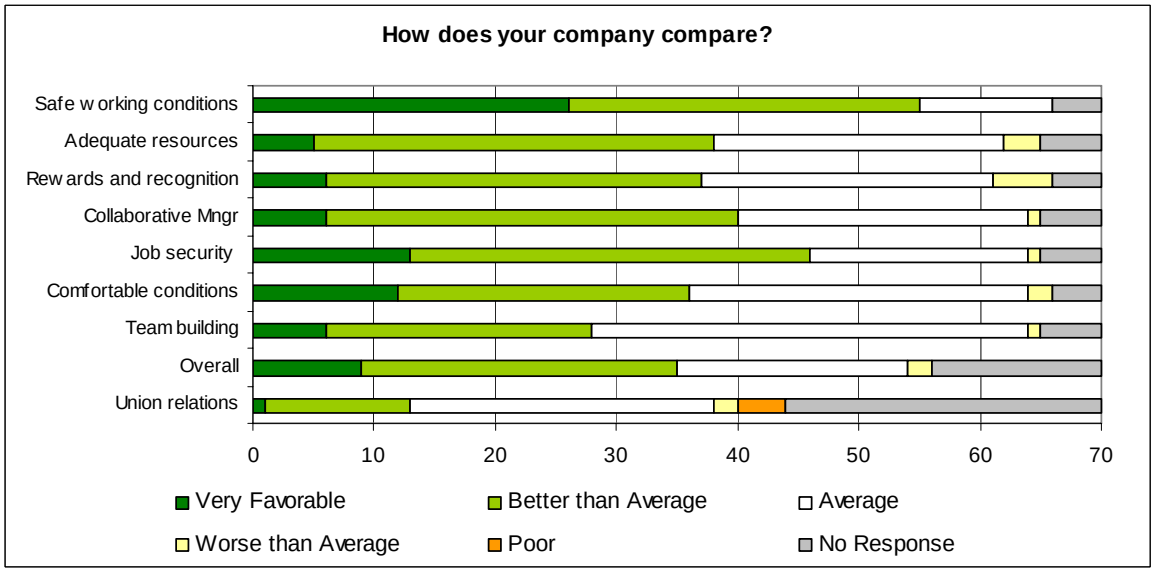
WORK/LIFE BALANCE





WORK ENVIRONMENT





C5. List any other areas that are important for attracting or retaining employees.

- Environment (28 respondents)
  - Location and labor market conditions in specific regions (6 responses)
  - Steady employment and job security (3 responses)
  - Business ethics and integrity (3 responses)
  - Workplace culture and environment (3 responses)
  - Respect for employees (3 responses)
  - Good management (2 responses)
  - Good company reputation
  - Healthy diversity climate
  - Stable organization
  - Team environment
  - Effective handling of generational differences in the workplace
  - Empowerment
  - Working in different parts of the country
  - Growth plan, strategy with how to grow in the industry
- Career (15 respondents)
  - Training and development opportunities (6 responses)
  - Career paths (6 responses)
  - Variety and challenge in work (2 responses)
  - Opportunity to conduct self-driven research and development
- Work/Life (6 respondents)
  - Allow more flexibility in work arrangements (4 responses)
  - Provide sufficient resources so employees may have a healthy work/life balance
  - More frequent times at home
- Compensation (2 respondents)
  - Incentive plans, benefits, alternate work schedules, management training
  - Higher pay

What change should your company make to best achieve the goal of maintaining a capable and committed workforce?

- Compensation (23 respondents)
  - Performance-based incentive pay (5 responses)
  - Increased compensation (4 responses)
  - Enhance 401K (3 responses)
  - Better benefits (2 responses)
  - Stock options
  - Compensate and respect the technical ladder as compared with management
  - If you want to retain people for the long run the CASH BALANCE pension plan is not the retainer. Consider a traditional pension plan.
- Career (10 respondents)
  - Training and development opportunities (4 responses)
  - Formal career paths (2 responses)
  - Our company could better define different job classifications and the associated training/compensation that goes with each. This would make it easier to entice employees to pursue more education and work into different areas.
  - Smaller teams more individual work
  - Improve performance management to increase link between company goals and individual performers.
  - Formalized succession planning or mentoring programs
- Workforce and Recruiting (12 respondents)
  - Continue to seek young, talented employees and also the occasional experienced worker to build our workforce.
  - Make them feel like they are valuable, part of team, and rewarded for their efforts (competitive compensation, flexible work schedules, more time-off, job security, and recognition for performance).
  - Communicate, we need to do a better job internally on job needs / requirements and filling with proper skill set.
  - Recruit and train more graduate and entry-level employees.
  - Increase higher-end recruitment resources to assist hiring of higher-end employees, develop focused management training programs to proactive strategies to address turnover related to aging workforce and competitive market.

  - Hire the best qualified, motivated employees who work well in a team environment.
  - Get the right people in line with the goals and objectives of the institute.
  - Develop proactive strategies to addresses turnover due to aging workforce.
  - Allow staffing increases in areas where burnout is prevalent.
  - Double-fill positions where retirements are expected for the purpose of knowledge transfer.
  - Develop strategies for keeping potential retirees from leaving by creating job shares or part time work.
  - Improve ability to rehire retired workers.

- Environment (3 respondents)
  - Be less averse to risk taking and more tolerant of mistakes that are not due to complacency.
  - Employee participation in operation of company.
  - Increased communication from senior leadership regarding company direction/strategy.

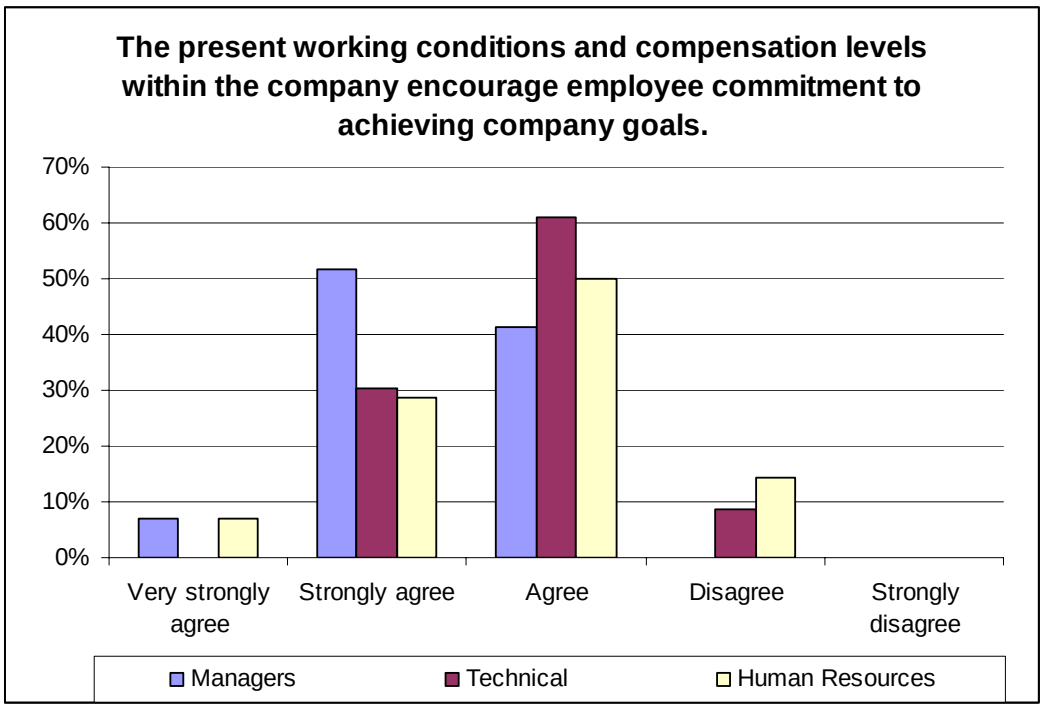
- Work/Life (6 respondents)
  - Allow more flexible work hours. (5 responses)
  - Ability to work from home.
  - Increase certain benefits such as paid time off.

- Management and Human Resources (7 respondents)
  - Management has to create an environment that employees want to work in. The old saying that employees quit bosses, not companies, still holds true today.
  - Give more training to managers to retain employees.
  - Maintain good communications with human resources.
  - Continue to support active input into company work processes by all employees.
  - Improve access to management.
  - Listen better to employees.
  - Increase communication from senior leadership regarding company direction/strategy.

- No changes required (2 respondents)
  - Continue with what we are doing.

- There is not much to be done; we diligently make time and spend much effort to determine our employee needs and do what we can to meet those needs.

C6. The present working conditions and compensation levels within the company encourage employee commitment to achieving company goals.



C7. What could your company or the industry as a whole change to become more attractive to potential employees?

- Public Relations and Perception (15 respondents)
  - Get the word out early to potential future employees. We need to get into the high schools, junior colleges and technical schools to partner with them -- to get these people interested early on and provide a reason for them to get educated. (3 responses)
  - Promote a positive image of the industry. Emphasize the value and positive impact of the pipeline asset we maintain. It is a critical aspect of energy infrastructure benefiting a large mass of population. (3 responses)
  - Better understand the younger generation, and focus on attracting people in the same way as the high tech firms did during the dot-com era. (2 responses)
  - Convey the strong future of the industry. Enhanced medical and retirement benefits.
  - Broader knowledge of the pipeline industry. The pipeline transmission industry is lumped with oil/gas that overall has different needs.

  - Better relations with universities to teach in areas specifically associated with pipeline technology.
  - Market the value of the work product/services our industry provides to the general population.
  - Do a better job of explaining the overall industry and the various segments within the industry, i.e., operators, service providers, pipe and equipment manufacturers, contractors, engineering and consulting firms, etc.
  - Change unstable, unreliable image, get the word out that this nation must have a reliable infrastructure and that we need employees to provide it, our place in the global economy depends on it. We should sponsor and educate students -- rear them to come to work in the industry starting at the secondary level.
  - Take on a more aggressive growth strategy as an industry – earnings.

- Stability (7 respondents)
  - If continuous employment could be offered, it could greatly enhance our ability to attract new employees. If the industry could find some way to schedule its work to allow for year round relatively level activity it would prove highly advantageous to us. (2 responses)
  - Company should obtain larger scale projects requiring full-service management and engineering.
  - Stop viewing professional service companies as commodities.
  - If the industry continues to develop new supplies which generate new pipeline projects which generate workload, thereby creating jobs and long-term job stability and growth, those would be significant factors in attracting employees.
  - Diversity of the business (work that we go after).
  - Globally our industry must offer more continuous and stable employment to give employees a sense of security they do not presently have in construction.

WORKFORCE AND KNOWLEDGE MANAGEMENT

M1. Do you expect significant changes in your physical infrastructure the next two years? Average up 20%, Pipelines up 22%, Services up 19%

Five years? Average up 39%, Pipelines up 25%, Services up 45%

M2. How do you expect this to affect your technical workforce headcounts within two years?

Average up 18%, Pipelines up 13%, Services up 20%

Five years? Average up 34%, Pipelines up 16%, Services up 41%

M3. How has regulation affected the need for a larger or smaller workforce?

- Larger workforce (32 respondents)
  - Pipeline integrity (4 responses)
  - The workforce has increased in order to deal with DOT regulations for our clients.
  - Increases work force to track changes, implement, and monitor for compliance.
  - Additional 6 employees.
  - Increased management, technical and craft.
  - There are more "watchdog" positions and a larger need for record keeping tasks.
  - Compliance had increased requirement 15%.
- Minimal impact (8 respondents)
  - No impact, but has increased complexity and the need for better management operating systems.
- Skills and training (3 respondents)
  - Impact due to the ability to take the time and cross train.
  - Requires more emphasis on displaying of skills.
  - Increased the need for preparing training procedures, training the employees about the requirements & documenting/tracking the training.

How has regulation affected the skills or knowledge set required of the workforce?

- Additional knowledge/skill sets needed (36 respondents)
  - Specific knowledge of inspection codes is very important for those working on that type project.
  - More details and documentation required.
  - More and more frequent training is required.

- Minimal Impact (6 respondents)

M4. What changes in government processes or regulations would improve your ability to meet your business objectives? How large of an impact is this? {Impact responses shown in brackets.}

- Process Improvements (8 respondents)
  - Having one regulatory authority in charge of all permit approvals would simplify and streamline the approval process. {A large impact as it saves time.}
  - FERC pre-filing process could use re-working. {moderate}
  - The regulatory process is typically long and drawn out much longer than necessary. If that process could be expedited it would let us move ahead with getting the work done without the painstaking efforts required today to get to a solution. {It is huge to the industry}
  - Eliminate meaningless reporting {2-3 employees}
  - In particular, the FERC needs to take a more pro-active approach with project permitting and not allow state and local interest groups to dictate in some cases unrealistic and costly requirements and mitigation. {In some cases it amounts to 5-10% of the overall project costs.}
  - Implementation/compliance deadlines are typically inserted at the time the regulation is proposed. While the proposed regulation moves through the comment and approval process the requirements of the regulation may change, making it difficult to react in an effort to get ahead, but the compliance deadline does not always get extended. The final approval of the regulation creates / forces a scramble to find the resources necessary to comply. {Large}
  - Streamlining of environmental regulations, specific response time out of government agencies. {0.1 equivalent headcount}
  - A change in the requirements of the Integrity Management rule -- let's get more sensible about what benefit there is to the documentation and analysis required. {Two or three full time equivalent positions.}
- Less regulation (5 respondents)
  - Less regulation {0.25 equivalent headcount }
  - Sarbanes (Sarbanes-Oxley Act of 2002) adds costs {2% additional equivalent headcount}
  - I don't think the government process or regulations have improved our business objectives. We have more government regulations that require more work to do the same work. {20 equivalent headcount}

- Consistency (5 respondents)
  - A standardization of Department of Transportation Operator Qualification (DOT OQ) tasks and qualification requirements across all operators. (2 respondents) {Considerable - DOT OQ is highly labor intensive to manage.}
  - More even approval process {major}
  - Consistent implementation of the regulations by all owners/operators {25-30% increase in cost}
  - Consistency with a meaningful "management of change" process. {10-20%}
- Clarify/Simplify Regulations (4 respondents)
  - The regulations make more projects for engineering to work on but the ”interpretation” of the government programs could improve. We seem to do rework and it is hard to keep younger people interested in the repeat work. {efficiency factor 0.85}
  - Consistency and good definition of policy would improve our ability to better understand policy requirements which would in turn increase our ability to meet our objectives. {In my opinion very large. There is too much ambiguity in policy.}
  - Clearer requirements -- fewer conflicts between requirements. {significant}
- Other
  - The Gas Transmission industry regulations are not properly aligned with the safe operation of our pipelines. {large}
  - Regulations and methods to provide part-time employment with some level benefits to retain highly skilled workers who don't want to work full-time.
  - Concern over potential tightening of security clearances {minor, but measurable}
  - Workers compensation {large}
  - Continue to focus on skills and abilities rather then required "training" {significant}
  - Less support of union agendas. Our company spends considerable time and money finding, training and educating employees. We have a track record of low turnover. It is aggravating to have unions pecking at our workforce and our customers with false propaganda. {Not too bad at the moment, but a constant distraction.}
  - Although not the good for industry, if the government limited the number of active projects it would allow more security and less turnover. For example, if the number of pipeline projects per year had a cap, it would allow companies to maintain staff and predict workload, rather than trying to deal with the cyclic nature of pipeline construction. In today's market, many of the high-quality welders have left oil and gas to go to more stable markets.

- Tort reform {difficult to estimate}
- Implementation of "performance based" (risk-based) regulation will allow more efficient allocation of resources. {Not quantified}

M5. What do you expect the INGAA Foundation to do for you in the area of workforce?

- Training Resources (11 respondents)
  - Offer more regulatory training at lower prices.
  - Would like to set up a school for training welders, inspectors and machinery operators.
- Standardized curriculum (3 respondents)
  - Standardized fields of study for new hires.
- Information/Communication (11 respondents)
  - Quantify industry needs and possible solutions.
  - Provide trends data for strategic succession planning.
  - Provide market and technical data.
  - Identify resources.
  - Facilitate a dialogue between pipeline companies and vendors /service providers.
  - Facilitate industry-wide symposiums, surveys and studies addressing current trends.
  - Develop better attracting, hiring, retaining and training techniques for employees.
- Government (9 respondents)
  - Standardize Operator Qualification processes and tasks. (3 respondents)
  - Change the Integrity Management rule to be more defined and less nebulous in regard to documentation and analysis required.
  - Work with the government to clearly define what the laws are meant to do and when a company complies, then back them!
  - Make the DC policy makers aware of this problem.
  - Continue to support changes in regulations.
  - Work with the legislature to help focus on education and also make it easier to "import" foreign resources that can help fill some of the gaps.
  - Lobby for more clarity and consistency in policy.
  - Encourage continued continuing educational offerings by the regulators (such as the FERC filing and environmental compliance seminars).

- Public Relations (4 respondents)
  - Selling our industry to the masses, etc.
- Recruiting (3 respondents)
  - Develop recommendations for improved recruiting efforts.
  - Help companies understand how to attract people to this industry.
- No help required or do not know (4 respondents)

M6. Would you be willing to collaborate with other INGAA Foundation members to expand training for your industry? 89% yes

M7. Do you view knowledge management and workforce as the same issue? 51% yes

M8. Do you track the cost for developing employees? 39% yes

What is the cost and which factors are used to compute that cost?

- Class costs and travel (5 respondents)
- Training budget (4 responses)
  - best estimate is our training spending of $1B/yr
- None/limited tracking (4 respondent)
- Class costs, travel, trainee's hours (3 respondents)
  - $10,000-$15,000 annually, training, hours, travel and expenses
- Trainee's hours (2 respondents)
- Don't know (2 respondents)
- Other (1 respondent)
  - Approximately one year’s salary (varies by employee type and skill level)

M9. Do you track the cost for recruiting employees? 33% yes

What is the cost and which factors are used to compute that cost?

- Labor to recruit (3 respondents)
- Labor to recruit and advertising (3 respondents)
- Advertising and recruiting firms (3 respondents)
- Budget for recruitment (1 respondent)
- Don't know

- Advertising, overtime for others in interim, training new employees; we try to evaluate efficiency loss of an experienced employee.
- Only costs paid to employment agencies and cost to relocate employees.
- Avg. $40,000 per person; relocation expenses, recruiting (internal and external), ramp-up, on-the-job training.

M10. Do you think workforce issues (retirements, smaller pool of skilled workers, technology-driven skill development needs, etc.) will present a material risk to your operational capability for meeting company goals over the:

Next two years? 58% yes

Next five years? 78% yes

Next 10 years? 80% yes

If yes to any, explain.

- Retirements and knowledge loss (15 responses)
  - Knowledge/skill shortfall in the future, have exposure during the short-term while training and transition knowledge/skills to a broader (internal) workforce.
  - Retirement of senior program managers and loss of knowledge base.
  - We have a 10 to 15-year gap between experienced people and the younger folks. As the older ones retire, the knowledge and experience leaving with them will not/cannot be replaced.
  - Losing non-replaceable employees.
- More difficult to find qualified candidates (12 responses)
  - Skilled workers who have good work ethics are becoming hard to find.
  - Competing with other companies for the same workers.
  - Increasing QHSE (Quality, Health, Safety, Environmental) responsibilities/risk is pushing technical abilities of workforce and increasing complexity (automation) is requiring a higher skilled workforce.
- Training and development programs (8 responses)
  - Reduced revenue last year and will likely continue until we implement plans to provide training.
  - We are losing experience at a high rate, and are struggling to develop employees to backfill these losses.
  - We have a large number of new employees through acquisitions and recruitment, and it will take years to train them to an acceptable level of technical expertise.

- Non-retirement Attrition (4 responses).
  - Engineers are in high demand; we have gone from 2-3% turnover per year to 20%.
  - Skilled tradesmen will be lured ($'s) by many industries due to the lack of human resources, development and training programs.
- Expansion projects resource constrained (3 responses)
  - Workforce is shrinking, and the number of projects are increasing. There just are not enough engineering and other disciplines to effectively handle all of the planned projects.
- Ability to attract new employees (2 responses)
  - Our industry is not attractive to younger people. It is very difficult to offer elements of employment involving constant travel, time away from families and other hardships when pay scales are not appreciably higher than those they can obtain and stay at home.
- Technology (1 response)
  - Changes the ability to maintain high levels of equipment reliability cost effectively.
- Workforce salary inflation (1 response)
- Workforce planning (1 response)

M11. What steps are you taking to mitigate the risks?

Supply (4 responses)

- Educational alliances (3 responses)
  - Working with local colleges, high schools and foundations to develop vocational schools and intern positions.
  - We are being more proactive with local vocational schools to attract the younger skill workers.
- Public Relations (1 response)
  - Working to change industry perception at the secondary level.

Recruit (14 responses)

- Increased recruitment efforts (10 responses)
- Increased compensation (1 response)
- Workforce planning (1 response)

  - Doing workforce planning t each location to anticipate needs about a year before vacancies occur.

- Increased New-Hire Qualifications (1 response)
  - We have stepped up our search and acquisition of mid-level field managers so they can step into supervisor roles sooner.
- Attractive Positions (1 response)
  - Improved quality-of-life for mid-career recruiting.

Develop (23 responses)

- Entry-level training programs (9 responses)
  - For the long term we have begun to do more entry-level recruiting.
  - We are trying to hire personnel with less experience or with good work ethic from related fields and train them to handle the project requirements.
  - Hiring more graduate engineers - developing in-house.
  - Grow your own capability outside traditional areas.
- Succession planning (4 responses)
- Knowledge management (4 response)
  - Have developed workforce plans, knowledge management plans, and skill development plans.
  - Developing knowledge transfer processes amongst existing employees. Better coordination company-wide on college recruitment efforts.
- Training (2 responses)
  - Investing in technical and leadership training; recruiting senior domain experts from within other businesses.
- Knowledge Transfer (4 responses)
  - Hiring new, young, talented employees to learn under the more seasoned, experienced personnel that will leave soon (2 responses).
  - Hiring experienced project managers who are willing to take young engineers under their wing to teach. Hiring young engineers who are interested in learning and fit our culture.
  - Trying to hire employees that can train with the experienced employees. Rotating employees to gain experience in other areas. Created a leadership development program.

Maintain (6 responses)

- Employee Retention (4 responses)
  - Salary adjustments and a lot of discussion about company culture and work place satisfaction.
  - We are trying to improve the employee satisfaction. Hoping our staff will be less likely to get pulled away by our clients, vendors and competitors.
  - We are trying to train and retain our present workforce by utilizing formal classes and mentoring programs along with providing benefits such as 401K plans, paid vacations, paid holidays and other such arrangements not often offered by our competition.
- Delay Retirement (2 responses)
  - Coax senior program managers to continue working on part-time basis to retain knowledge base, hire and train entry-level/junior staff with active recruitment and training programs.
  - Looking at 30 hour work weeks with benefits to entice retirees to consider coming back on a reduced schedule, etc.

Other

- No changes or don't know (2 responses)

EXTERNAL EDUCATION, PR, LOBBYING, AND STRATEGIES

E1. Do you have programs in place or planned with regional educational programs, such as colleges or skilled trade schools, to increase the size and quality of your recruitment pool for technical employees? 50% yes 50% no

If so, what type?

- We have an active college recruiting/relations program.
- Development in process
- We partner with an area university engineering school, as well as a technical high school to promote our "brand".
- In progress w/local community college

If not, do you feel these would be beneficial? 71% yes 29% no

Who would you need help implementing this type of longer-term strategy? 70% yes 30% no

E2. Do you feel that the development and implementation of a standardized industry curriculum for critical skills sets would helpful as a longer-term strategy? 70% yes 30% no

E3. Is your company aware of or involved in programs for government grants for funding educational programs? 13% yes 87% no

If yes, what program(s) are they?

- State by state. Some programs also in the UK and Germany.
- Workforce services provides subsidies for on the job training for hard-to-place hires.

If not, would this be beneficial? 40% yes 60% no

E4. Would a company or industry alliance with trade unions at an industry or foundation/trade group level assist in promoting the skills sets required in your industry? 40% yes 60% no

E5. Would a company or industry alliance with executive or technical placement firms at an industry or foundation/trade group level assist in improving the availability of critical skills? 70% yes 30% no

E6. Would additional lobbying activities specific to workforce shortages be valuable?

46% yes 54% no

If so, what type?

- Immigration (3)
  - Immigration reform to address highly skilled worker shortages.
  - Increase H1B limit and make available year round.
- Government to help with tax breaks and additional training programs.
- Focus on attracting and retaining highly skilled professionals.
- Education to high schools about the benefit of a technical career path.

E7. Would there be value in an alliance with companies outside the gas industry in addressing the skills shortage as a longer-term strategy. 69% yes 31% no

E8. Do you consider adopting new projects or new technology that would be attractive when recruiting employees with specialized or competitive skill types? 65% yes 35% no

E9. Are there any other external actions (outside of the transmission industry) that should be considered?

- Effectively tapping the military for technically trained personnel (2 responses).
- There may; however this is so foreign to our industry, so it is hard to gauge at this time.
- Go to the broader pipeline services and utilities. All are facing the same issue.

APPENDIX C – SECONDARY RESEARCH

BACKGROUND

This research will gather objective data for analysis. Some of the key areas of research are:

- Supply
  - Workforce characteristics
  - Educational trends for technical employees
  - Industry trends
- Recruit
  - Competition from outside industries for similar job classifications
- Develop
  - Knowledge management
- Maintain
  - Attrition and Retention

This research was conducted by Interliance with a variety of sources:

- Data from the Bureau of Labor Statistics
- Commercial job posting websites
- Public records
- Publications
- Proprietary Interliance materials

SOURCE FOR TECHNICAL EMPLOYEES

WORKFORCE CHARACTERISTICS

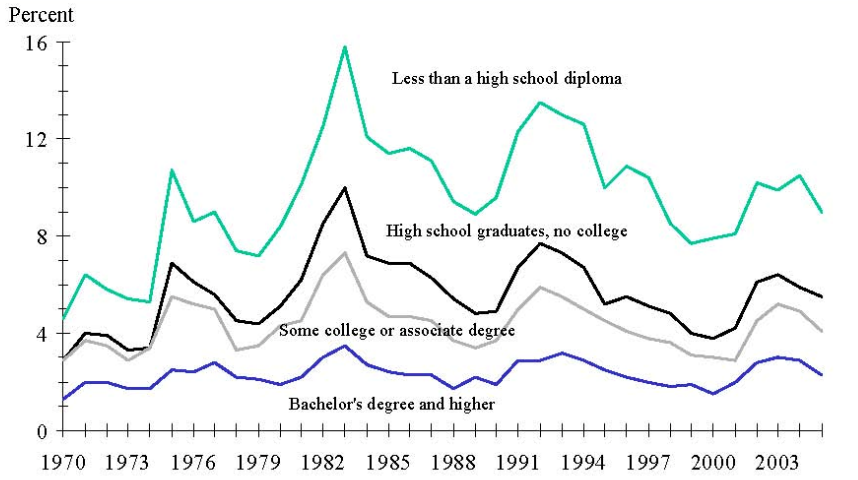
The Department of Labor periodically publishes historical data about the US Labor force. The following charts are taken from the June 2006 publication, *Charting the U.S. Labor Market in 2005*. The document is described in the preface:

> "This report includes graphs and text describing the U.S. labor market in 2005. Highlights include information about educational attainment, race and Hispanic ethnicity, women, and families."
>
> "These data were compiled from several statistical programs of the Bureau of Labor Statistics and are presented together to give an overview of the employment and unemployment situation for the nation that presents both recent data and historical trends over time."

Selected charts are shown in this section:

- Workers with higher levels of education are experiencing lower unemployment.

Chart 2-2. The gap between the unemployment rates of those without a high school diploma and those who have completed college is wider today than it was in 1970

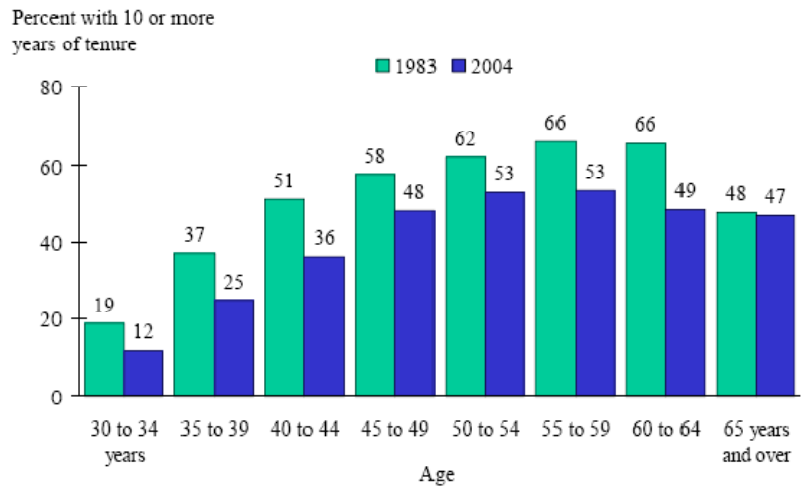


NOTE: Data are from the March 1970-2005 Current Population Survey and are for persons age 25-64. Beginning in 1992, data are based on highest diploma or degree received; prior to this time, data were based on years of school completed.

SOURCE: Bureau of Labor Statistics

- Men are changing employers more frequently that in the past.

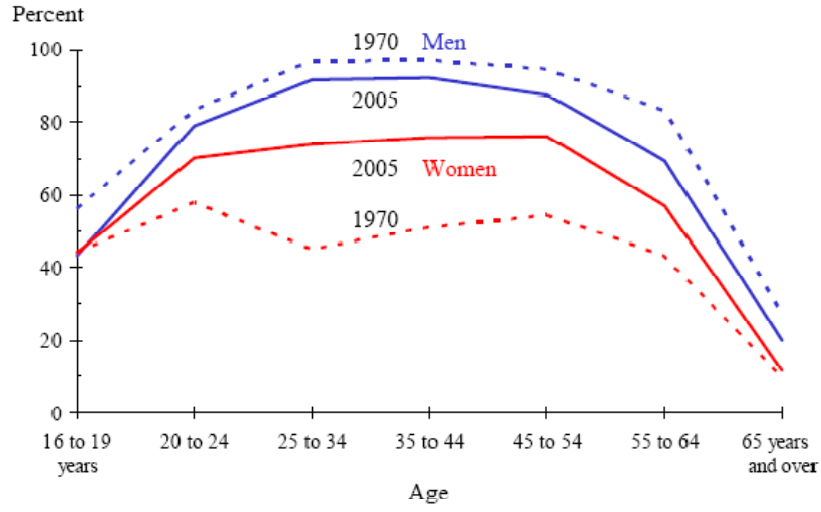
Chart 3-9. Declining proportions of men have worked for their current employer for 10 years or longer



SOURCE: Bureau of Labor Statistics

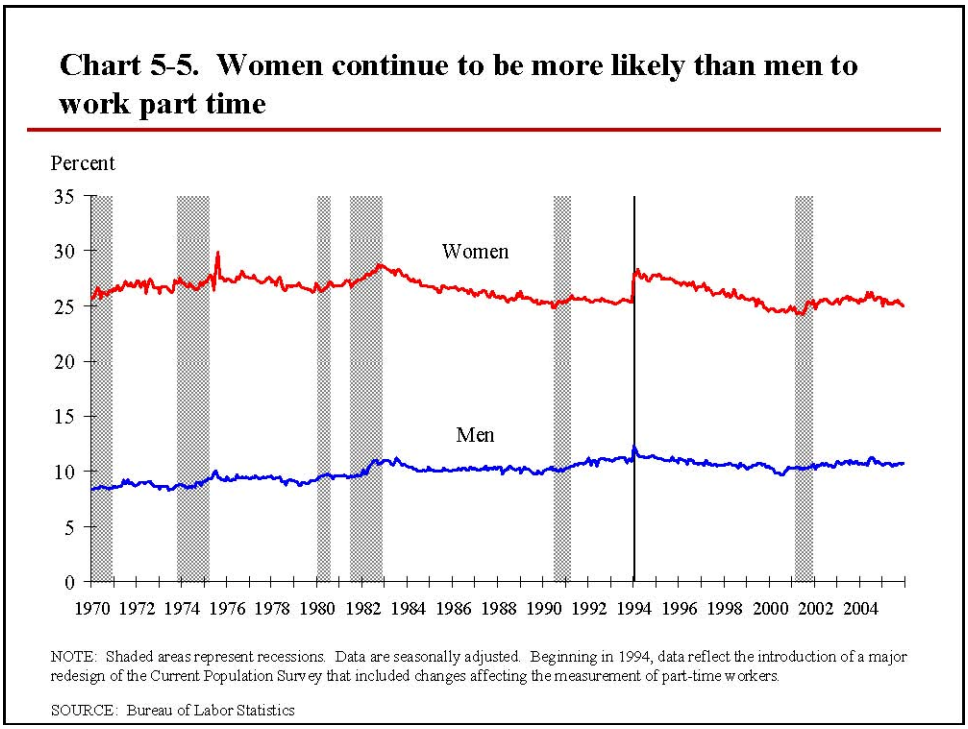
- More women are entering the workforce.

Chart 5-2. Women's labor force participation patterns are now more like those of men

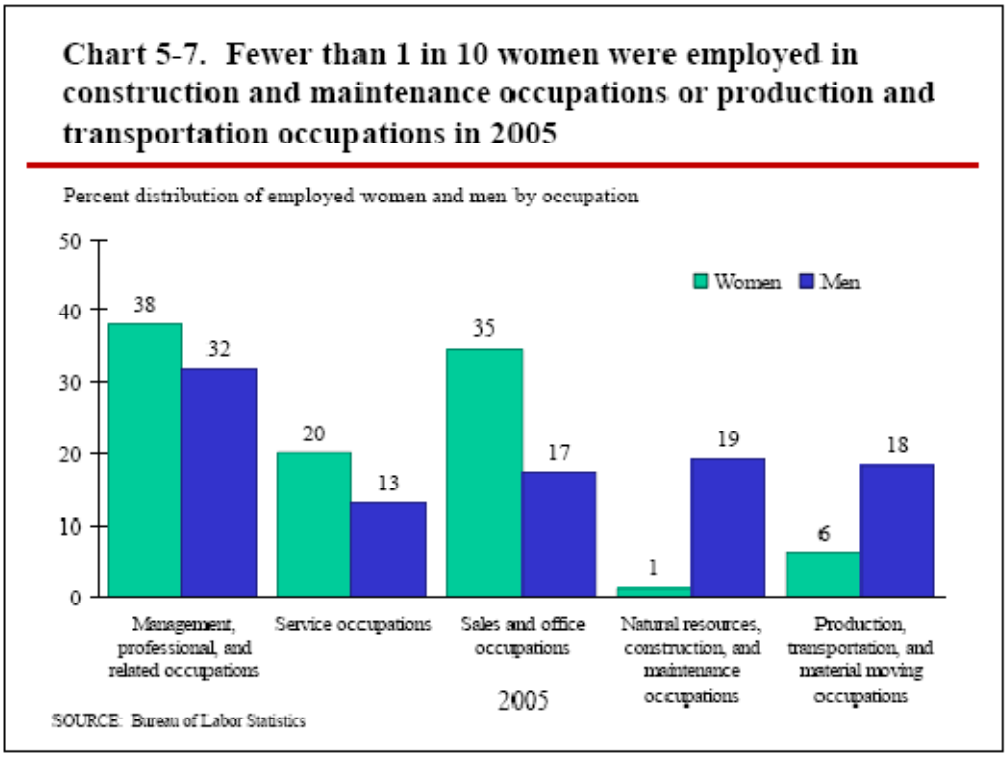


SOURCE: Bureau of Labor Statistics

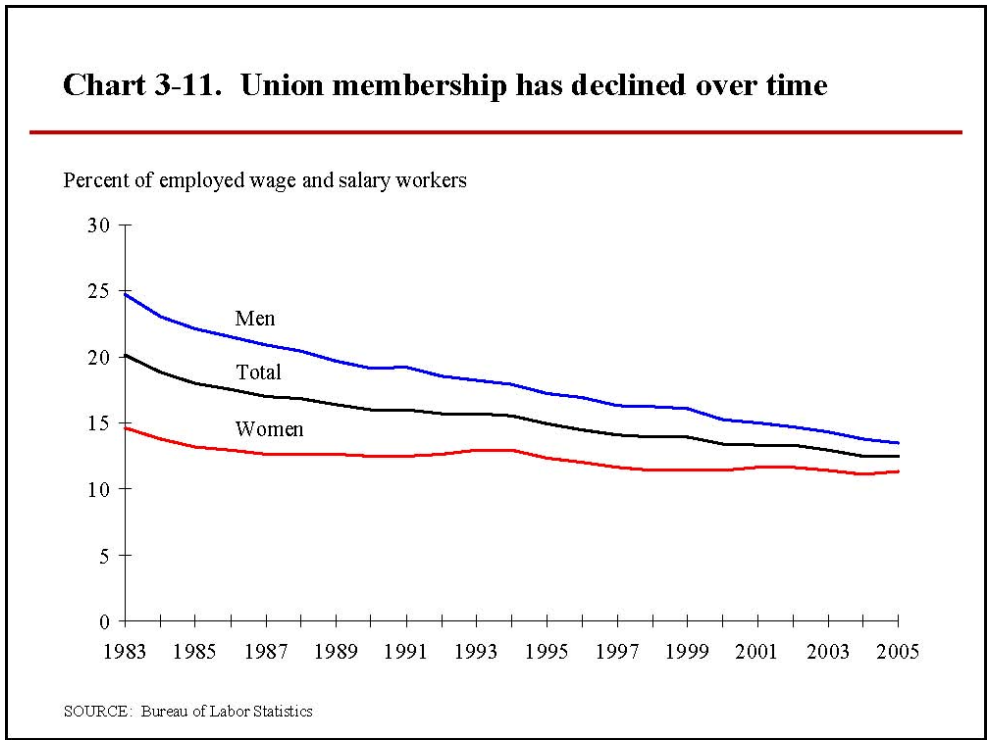
- 25 percent of women work part-time.



- Men outnumber women 19 to 1 in natural resources, construction, and maintenance occupations.

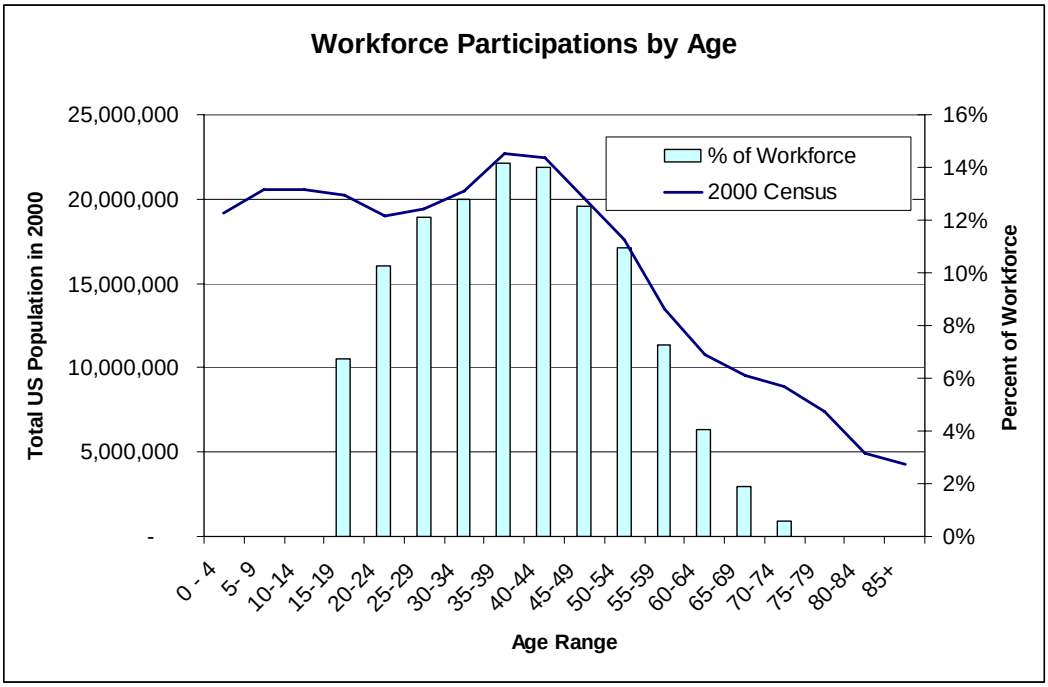


- Union membership is declining.



From the US Census data:

- The largest population of workers is in the 35-39 and 40-44 age ranges.



Demographics and Employment Overview:

Present level of unemployment is lower for more skilled workers.

Employees are changing employers more than in previous years.

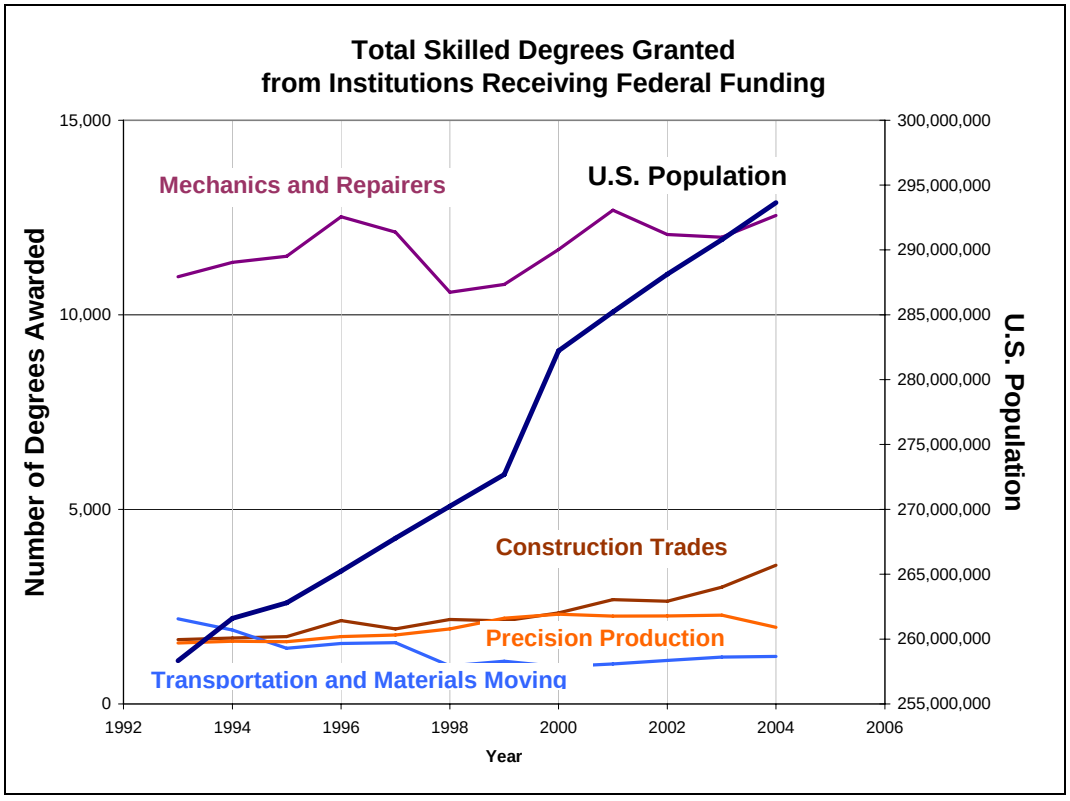
Women's roles are changing.

- Women's employment levels are approaching men's, although more women work part-time.
- Five percent of the employees in natural resources, construction, and maintenance positions are women.

SKILLED TRADES

TRADE SCHOOL DEGREES

Numbers of trade school degrees have remained flat over last decade, while the US population has added 32 million people.



The Department of Labor predicts that employment in skilled trades will rise by up to 16% over the 2004 to 2014 time period.

National Employment Trends	Employment		Percent	Present
	2004	2014	Change	Openings
Operating engineers and other construction equipment operators	381,600	425,900	12%	14,240
Welders, cutters, solderers, and braziers	377,000	395,900	5%	12,540
Control and valve installers and repairers, except mechanical door	37,800	39,700	5%	1,130
Electrical and electronics repairers, commercial and industrial equipment	72,400	79,400	10%	2,290
Industrial machinery mechanics	219,900	219,500	0%	4,430
Pipe layers	62,400	68,600	10%	2,050
Plumbers, pipe fitters, and steamfitters	498,600	576,600	16%	19,270

The average wages for skilled trade employment in 2005.

Average Wages for Selected Skilled Trades	Pay Period	2005				
		10%	25%	Median	75%	90%
Heavy Equipment Operators	Hourly	$11.16	$13.44	$17.23	$23.04	$29.69
	Yearly	$23,200	$28,000	$35,800	$47,900	$61,800
Welders, Cutters, Solderers, And Braziers	Hourly	$9.85	$12.01	$14.90	$18.21	$22.06
	Yearly	$20,500	$25,000	$31,000	$37,900	$45,900
Control And Valve Installers	Hourly	$9.85	$12.01	$14.90	$18.21	$22.06
	Yearly	$20,500	$25,000	$31,000	$37,900	$45,900
Electrical And Electronics Repairers, Commercial And Industrial Equipment	Hourly	$13.12	$16.64	$21.21	$25.80	$30.11
	Yearly	$27,300	$34,600	$44,100	$53,700	$62,600
Industrial Machinery Mechanics	Hourly	$12.48	$15.38	$19.11	$23.56	$28.39
	Yearly	$26,000	$32,000	$39,700	$49,000	$59,100
Pipe layers	Hourly	$9.29	$11.18	$13.83	$18.95	$24.94
	Yearly	$19,300	$23,300	$28,800	$39,400	$51,900
Pipe fitters	Hourly	$11.89	$15.29	$20.27	$26.86	$33.83
	Yearly	$24,700	$31,800	$42,200	$55,900	$70,400

Many skilled tradesmen have some college education.

Highest Level of Education Attained	High School or Less	Some College	Bachelor Degree or More
Operating engineers and other construction equipment operators	78%	20%	2%
Welders, cutters, solderers, and braziers	75%	23%	2%
Control and valve installers and repairers, except mechanical door	55%	32%	13%
Electrical and electronics repairers, commercial and industrial equipment	31%	63%	6%
Industrial machinery mechanics	60%	35%	5%
Pipe layers	67%	28%	5%
Plumbers, pipe fitters, and steamfitters	67%	28%	5%

The Labor Department is unsure whether there will be shortages in construction trades.

- Construction trades will grow at a 1.6 percent rate annually, compared to 1.1 percent overall job growth.
- Immigrants are twice as likely to work in construction trades (ten percent to five percent).
- An actual shortage of workers is “highly unlikely”; however, skilled, trained, productive workers in a geographical region may not match requirements.
- The Department of Labor reports that measuring the adequacy of training in construction trades is not possible because there are no reliable figures as to the number of persons being trained, or standardized curriculum for comparison.
- A large share of formal training is conducted in the unionized segment of the industry.

PIPEFITTERS AND PIPELAYERS

According to the Department of Labor, one in every three pipelayers/pipefitters belongs to a union. By and large, the unions associated with this profession are managed by the United Association of Plumbers and Pipefitters (UA). This organization is home to over 100 local chapters and over 300,000 members in the United States and Canada. The UA website offers basic information about job training (called Apprenticeships) while each local chapter provides and discusses specific information regarding requirements for application, training qualifications, and selection criteria for applicants. The same certification process, however, is common within the union organization: each individual accepted into the apprenticeship program must complete 5 years of training (between 1,700 and 2,000 hours on-the-job training per year, 216 hours minimum classroom instruction per year).

Common minimum requirements for application to the apprenticeship program: at least 18 years old; high school diploma or GED equivalent; U.S. citizenship; physically able to conduct duties described in the job description. To be considered, each applicant must pay an application fee, complete and pass an aptitude test, and attend an interview. After completing the requirements, each applicant is evaluated. Evaluation procedures can vary according to local union standards, but the emphasis in selection is placed on interview performance and test results. The union will then offer training to a predetermined number of candidates which depends on the number of openings in the job market. Individuals accepted into the program will have the benefits of a full-time, paid position as well as classroom instruction paid for by the union. The majority of programs provide classroom instruction through local technical and community colleges while some have their own training centers and facilities. While on the job, apprentices will be under the supervision of a journeyman (certified plumber/pipefitter). Starting wages for apprentices are a percentage of certified journeymen, increasing periodically over the five year training period and beyond.

HEAVY EQUIPMENT OPERATORS

The International Union of Operating Engineers (IUOE) is an organization that consists of local chapters; each local chapter conducts its own selection process into Apprenticeship programs. The apprenticeship program is four years (40 hours per week on-the-job training, 144 hours per year in classroom instruction).

In summary, qualification in the skilled trades requires a large investment of time and training:

- Pipefitter/Pipelayer
  - United Association of Plumbers and Pipefitters (UA)
  - Five years of training, including 1080 hours of classroom training
  - Unions provide classroom instruction, most through local technical and community colleges, while some have their own training centers and facilities.
- Heavy Equipment Operators
  - International Union of Operating Engineers (IUOE)
  - Four years of training, including 576 hours per year of classroom instruction

Skilled trades schools that offer training for pipefitters, pipelayers, and heavy equipment operators are shown in Appendix D.

The Department of Labor has resources in the form of training grants and assistance for companies or industries interested in setting up apprenticeship programs. More information about these can be found in Appendix D Resources.

ENGINEERING GRADUATES

OVERVIEW

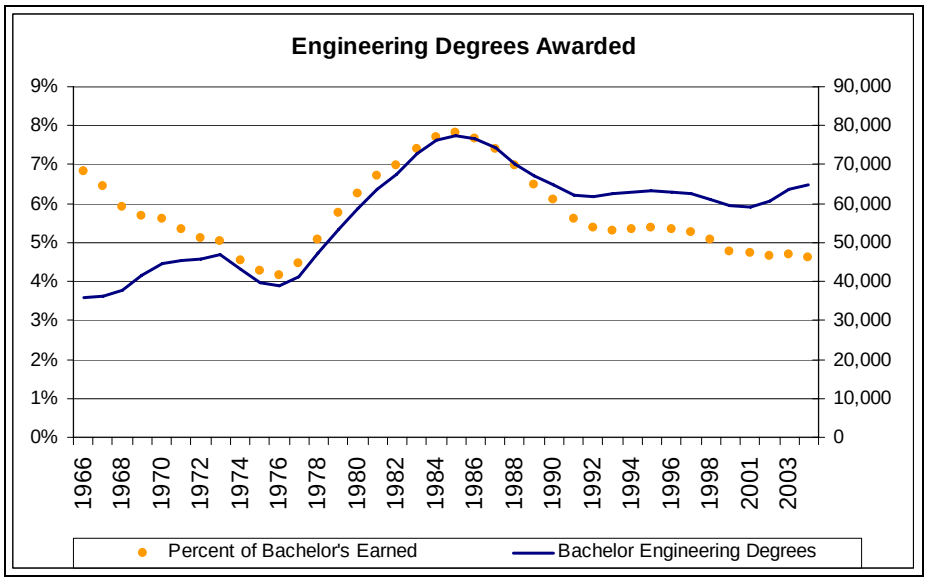
The number of engineers graduating with bachelor's degrees has remained steady for the last several years. Demand for engineers has also remained steady and is forecasted to rise more slowly than the overall workforce. The shortage of engineers discussed in many publications is moderate to medium in severity, and results in a premium of 39% starting salary over the average college graduate ($50K vs. $36K). Collins (1991) developed a model using historical data that indicates this salary premium influences younger student's choice of a major, and in turn increases the supply of engineers after a four to five year lag. This effect was seen in the 1980's as a result of large increases in salary caused by increases in Department of Defense hiring.

Companies experiencing the most severe shortages are those trying to hire engineers with particular skill sets not learned as part of the typical BS program. These may be skills in a particular industry or with a particular technology.

Overall the natural gas transmission industry will need to increase its hiring of engineers over the historical level to keep pace with projections of a 16% increase in technical staff for pipeline companies and a 41% increase in technical staff for service companies over the next five years.

DETAILS

Engineering has traditionally drawn about 5.5% of students earning a bachelor's degree. This has fluctuated between a high of almost 8% during the peak years in the mid 1980s to a present level of 4.6%.



From the National Science Foundation (NSF):

There are many avenues for correcting labor market imbalances generated by disparate growth patterns, including the following:

- More students can pursue college degrees and major in high-growth occupational specialties and fewer will enter training in low-demand specialties.
- Recent graduates with related degrees can seek additional training to qualify in high-growth employment categories.
- Early retirement can occur in cases of excess supply; postponements, in cases of excess demand.
- Personnel standards can be relaxed when excess demand develops.
- Personnel can be retrained and occupationally upgraded.
- Migrants from abroad can lessen supply/demand differentials in high-demand areas.
- Individuals educated and trained in science and engineering fields that are in excess supply may have to seek alternative careers.

The NSF goes on to say that these adjustments can correct for up to 60% of the imbalances for the worst-case scenario predictions. Factors limiting supply-side flexibility:

- The adjustment mechanisms the supply system incorporates are not without costs in lost productivity; retraining expenses; and employer, industry, and occupational mobility.
- In the high-growth scenario, it may prove difficult for higher education to respond to the demand for degrees in fields experiencing relatively high supply/demand differentials.

SUMMARY FOR STATE OF ENTRY-LEVEL ENGINEERS

- The total number of engineering graduates remains steady, although it is declining as a percent of total graduates.
- The Department of Labor forecasts engineering positions growing at about the same pace as overall job growth.
- The President's Council of Advisors on Science and Technology cites the conclusion "neither earnings patterns nor unemployment patterns indicate a science and engineering shortage in the data we are able to find" (Butz et. al 2003).
- Total engineering employment in the US has fallen by 13,000 positions from 1,462,000 in 1998 to 1,449,000 in 2004.

- Historically, salary premiums paid to engineering graduates versus the total graduate population affect the supply of engineers by influencing high school and college freshmen's choice of a major. As shortages increase starting salaries, more students select engineering majors.

NATURAL GAS ENGINEERING SPECIALTIES

The Department of Labor does not track specialties within the Natural Gas industry, such as those listed as greatest in demand from survey respondents:

- Pipeline engineer
- Senior project engineers
- Engineering in specialty areas such as friction stir, non-destructive evaluation and plastics
- Storage and reservoir engineers
- Engineers with experience in compression and measurement

Therefore, the supply of engineers in these specialties is not easily tracked. Supply shortages will be assumed for the purpose of the strategy, based on the survey responses and experience of the INGAA Foundation steering team.

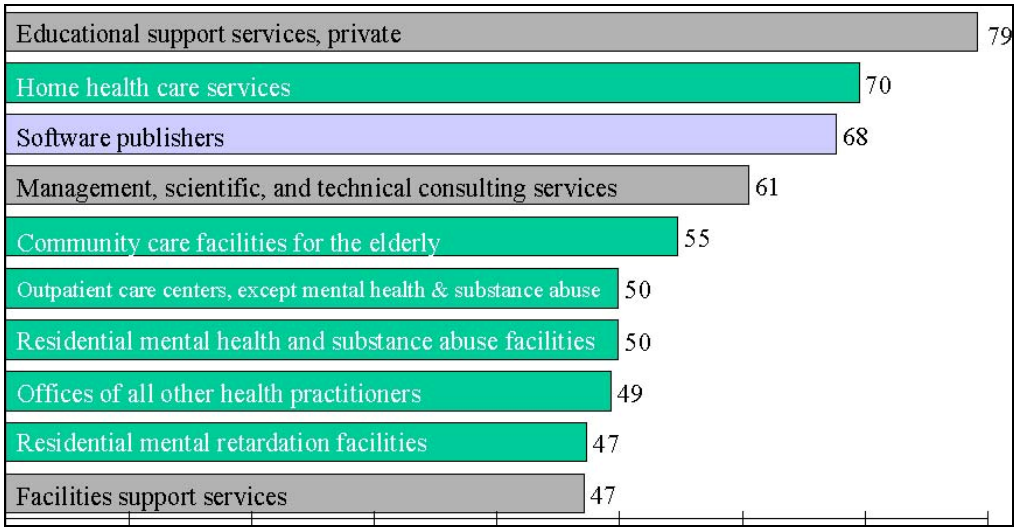
EDUCATION OVERVIEW

- Trades
  - Trade school degrees have been flat compared to total population.
  - Construction trade supply is difficult to predict because training of new workers is not tracked.
- Unions
  - Skilled trade qualification requires a significant time investment.
  - Union membership is declining.
- Engineering
  - Bachelor's degrees in engineering are on a downward trend from a peak of 7.8 percent of all degrees in 1985 to 4.6 percent in 2004.
  - Engineering jobs are likely not to increase faster than the supply.
  - Engineers with degrees or experience in the natural gas industry are difficult to track, and survey data shows that they are the hardest employees to recruit.

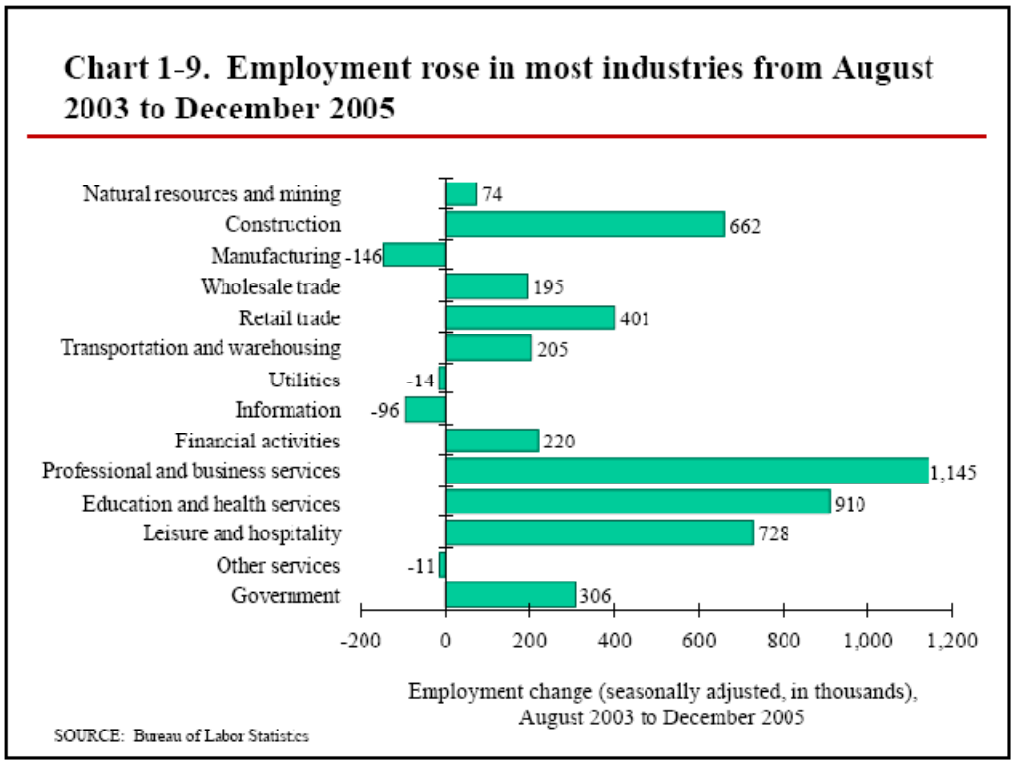
RECRUITMENT

EMPLOYMENT PROJECTIONS

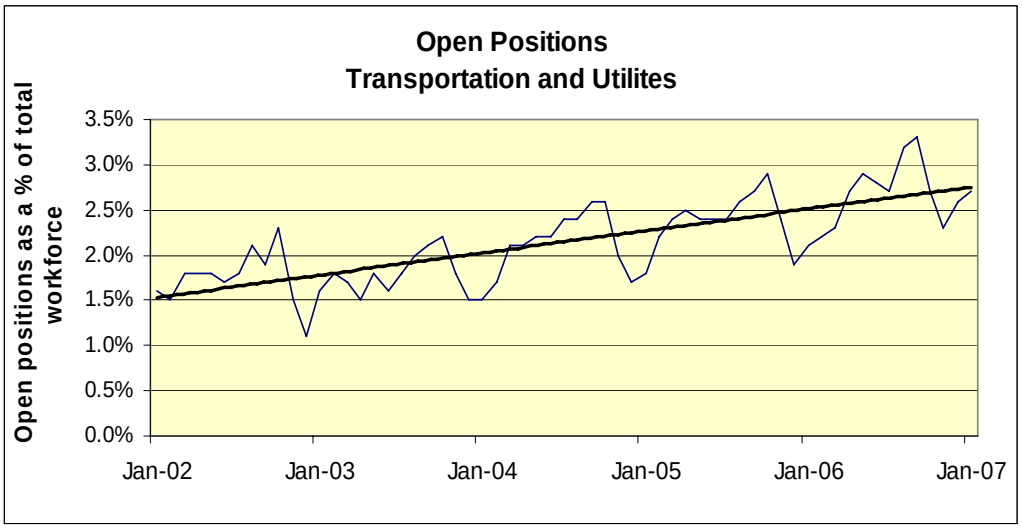
Technical consulting is projected as the fourth fastest growing industry. Department of Labor Projections for percent increase in industries 2004 - 2014



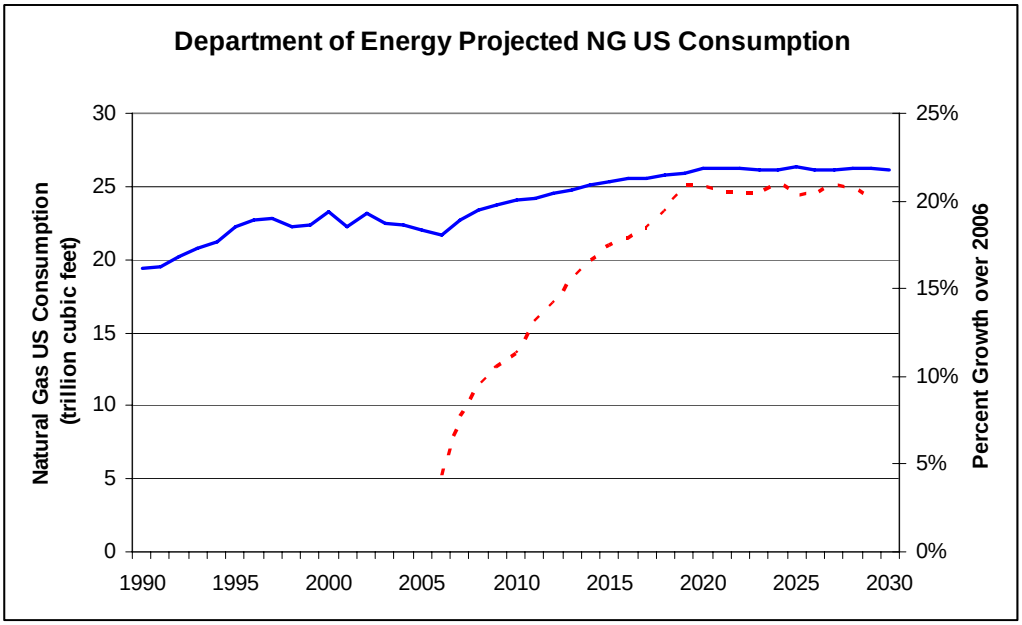
The construction industry added 662,000 jobs from 2003-2005.



At present, open positions in the transportation and utilities industries are increasing.

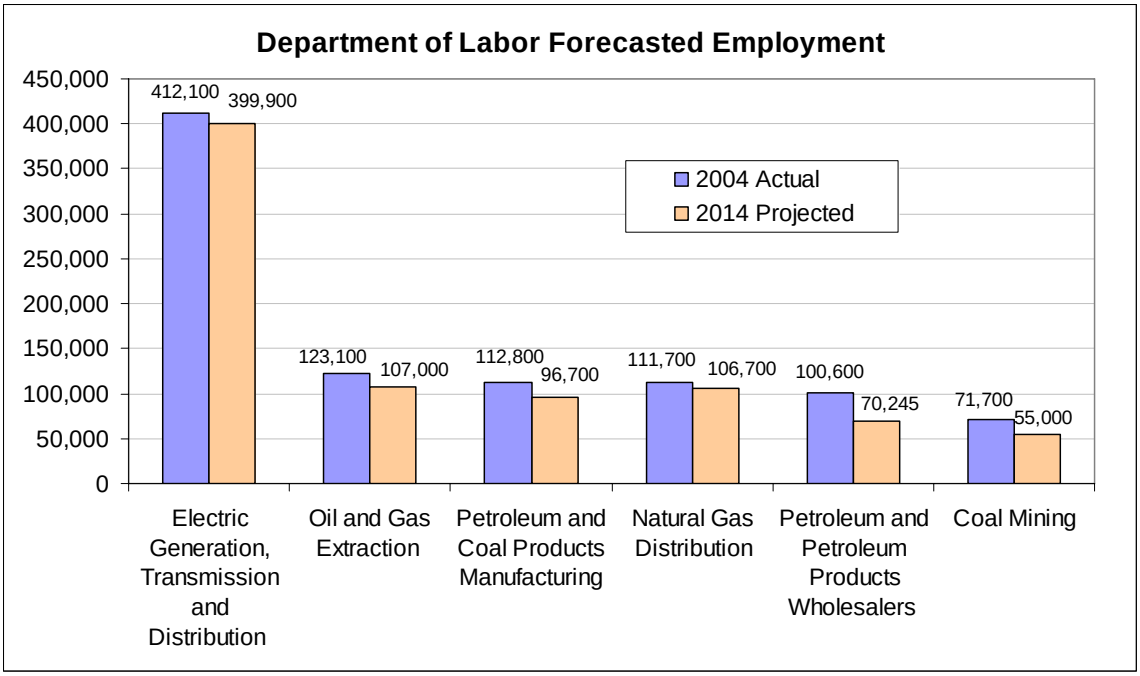


The U.S. Energy Information Administration projects that natural gas usage will rise by 20% over the next 12 years, then remain flat after 2019. The dotted line on the following chart represents the percent growth, and the solid line represents total US natural gas consumption.



Department of Labor Assessment of Utility Industry

The Department of Labor predicts falling employment in utilities and natural resources.



Industry	Employment	%	Percent change by 2014	Average Hourly Wage
Total, all utilities	570,000	100%	-1%	$ 24.98
Electric power generation, transmission, and distribution	412,000	72%	-3%	$ 26.49
Natural gas distribution	112,000	20%	-4%	$ 25.32
Water, sewage, and other systems	46,000	8%	21%	$ 18.30

From the Department of Labor:

"Although electric power and natural gas are essential to everyday life, employment declines will result from improved production methods and technology, energy conservation by consumers and more efficient appliances, and a more competitive regulatory environment. However, this decline in employment may be tempered by an increasing demand for safety and security workers to help ensure the protection of the nation's power plants and the safe transportation and storage of its hazardous materials.

"Reorganization of electric and gas utilities has increased competition and provided incentives for improved efficiency. For example, non-utility generators of electricity, such as a major industrial plant operating its own power generators, are permitted to sell their excess electricity to utilities at competitive rates. Also, independent power producers can build electric power generating plants for the sole purpose of selling their power to utilities. These producers generally build gas-turbine generating plants, which have lower construction and environmental costs, employ fewer workers, and, depending on fuel costs, usually can sell electric power more cheaply than the coal-powered, steam-turbine generator plants.

"In the gas transmission and distribution industry, regulatory changes now allow wholesale buyers to purchase gas at competitive rates from any producer and to use the gas pipeline transmission network to transport the gas. This process also is occurring at the distribution level. These changes have caused an increase in gas and electric utility mergers, workforce reductions, and the redesign and reallocation of job duties in a process that will continue through the 2004-14 projection period.

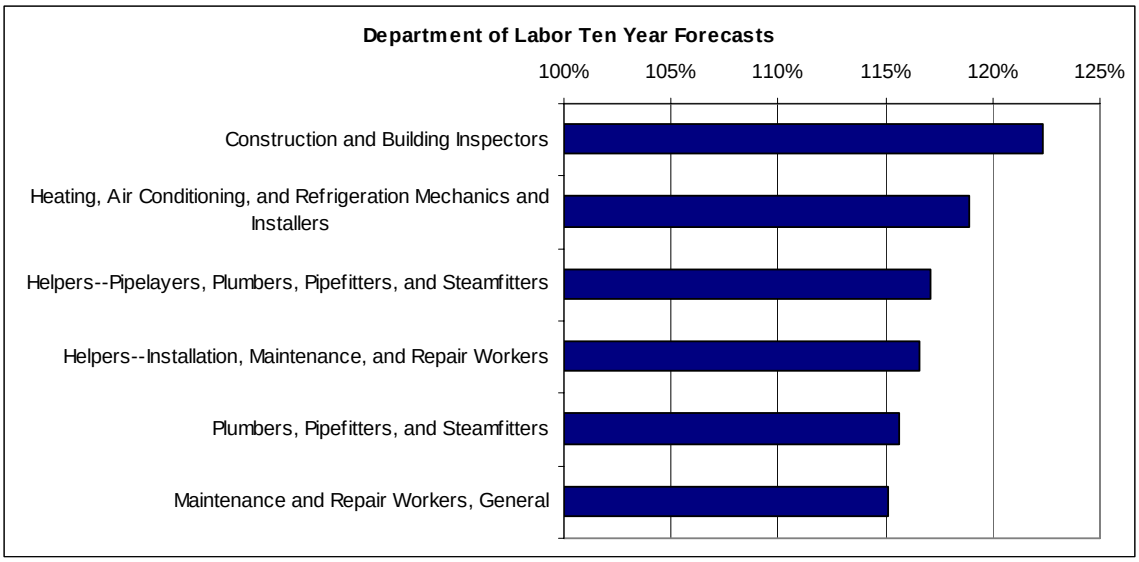
"New and continuing energy policies also provide investment tax credits for research and development of renewable sources of energy and ways to improve the efficiency of equipment used in electric utilities. As a result, electric utilities will continue to increase the productivity of their plants and workers, resulting in a slowdown in employment opportunities. This slowdown will lead to keen competition for some jobs in the industry. However, highly trained technical personnel with the education and experience to take advantage of new developments in electric utilities should face good prospects for employment.

"Technology and automation will adversely affect natural gas distribution utilities employment. Although natural gas is an increasingly popular choice among homeowners, businesses, and electric utilities, the efficiency of natural gas furnaces has increased considerably, thereby reducing average home consumption. These energy-conserving technologies will likely continue to minimize the relative use of natural gas by most industries and by individual homes. In addition, utilities in colder climates have increasingly automated their meter reading and billing procedures. Combined, these developments are projected to result in a decrease in employment in natural gas distribution services.

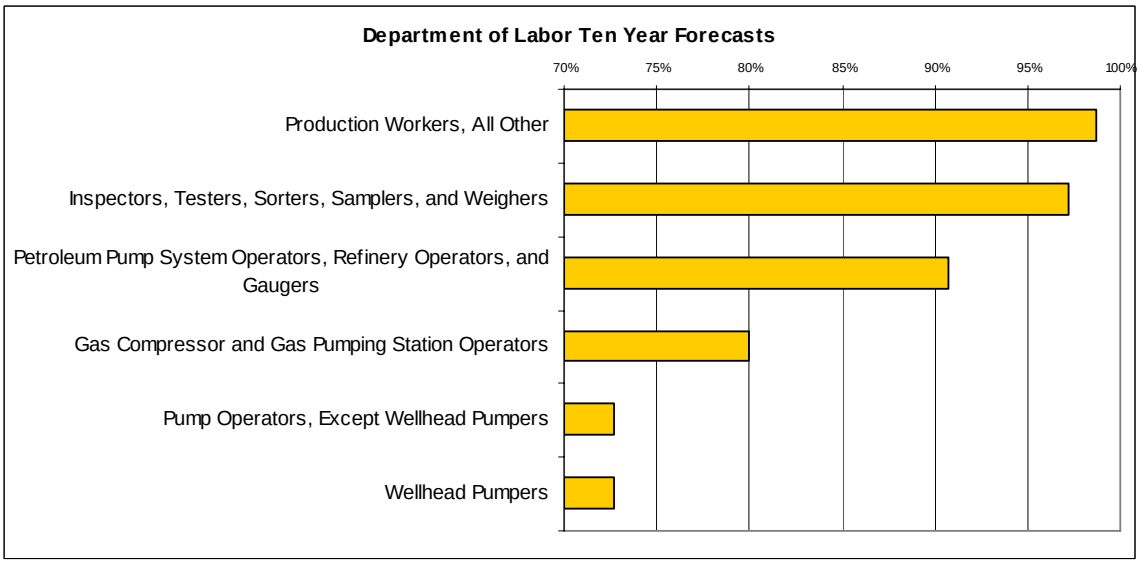
"In general, persons with college training in advanced technology will have the best opportunities in utilities industries. Computer systems analysts and network systems and data communications analysts are expected to be among the fastest growing occupations in the professional and related occupations group, as plants emphasize automation and productivity. Some office and administrative support workers, such as utilities meter readers and bookkeeping, accounting, and auditing clerks, are among those adversely affected by increasing automation. Technologies including radio-transmitted meter reading and computerized billing procedures are expected to decrease employment."

This analysis was found at the following webpage upheld and maintained by the U.S. Department of Labor: http://www.bls.gov/oco/cg/cgs018.htm

However, some job classifications employed in the natural gas industry are expected to rise overall. Forecasts show the need for construction and maintenance positions rising fastest.



Technical positions losing the most employment are in the operations areas.



In summary:

- Mergers and technology result in the need for fewer, more highly-skilled employees. The Department of Labor predicts:
  - In the gas transmission and distribution industry, regulatory changes now allow wholesale buyers to purchase gas at competitive rates from any producer and to use the gas pipeline transmission network to transport the gas. This process also is occurring at the distribution level.

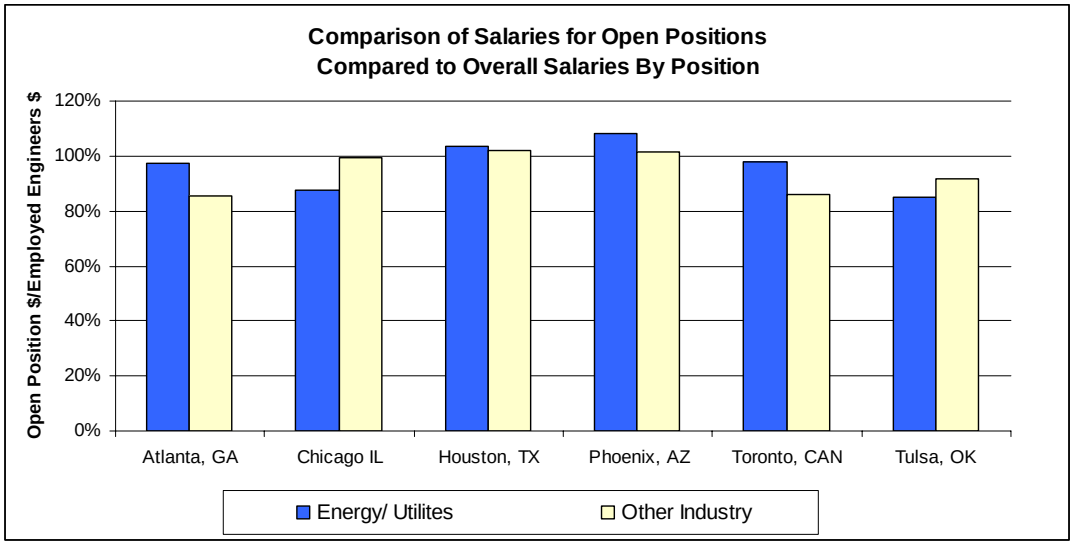
  - These changes have caused an increase in gas and electric utility mergers, workforce reductions, and the redesign and reallocation of job duties in a process that will continue through the 2004-2014 projection period.
  - Technology and automation will also adversely affect natural gas distribution utilities employment. Computer systems analysts and network systems and data communications analysts are expected to be among the fastest growing occupations.
  - Construction and maintenance jobs will increase, while operations employment will decrease.

- Technical consulting is projected as the fourth fastest growing industry. The construction industry added 662,000 jobs between 2003 and 2005.
- Open positions in the transportation and utilities industries have been increasing over the last five years.

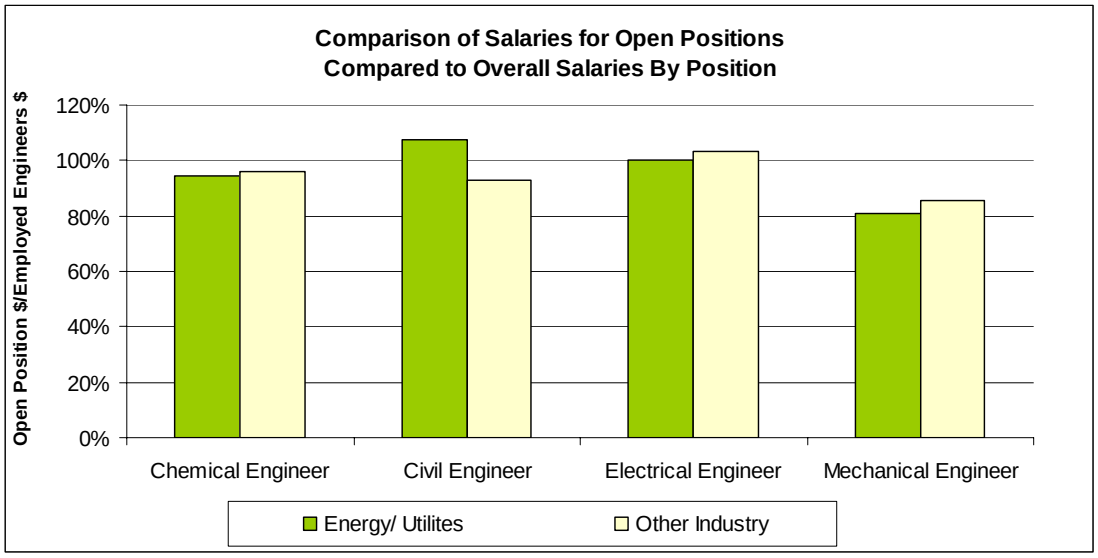
COMPETITION FROM OUTSIDE INDUSTRIES

An area for consideration was competition from other industries that hire the same skill sets. An analysis of job postings from Monster and HotJobs websites compared salaries, while controlling for engineering type, location and experience level (using the job posting websites' ratings of levels I through V).

Salaries posted for 1699 advertised positions for chemical, civil, electrical and mechanical engineers were compared to averages for the same years of experience and location. The results show that salaries are comparable between energy/utilities and other industries.



Advertised positions, as a group, offered 95 percent of the average salary of employed engineers, comparing these job postings to average salaries from the Salary.com website.



When the same data is grouped by degree, instead of location, the differences are even less. The one exception is open positions for civil engineers offer a 15 percent higher salary in the energy/utilities industry.

There was no statistically significant difference between positions advertised in the energy/utilities industry when compared to other industries. On average, energy/utilities offered two percent higher salary for any position. Civil engineers are more highly paid in utility companies.

Also, Department of Labor information was used to compare salaries of other technical positions between employment in utilities and all other employment. This showed that utilities pay an average of 21 percent more for the same job classifications when compared to the average of all industries.

Occupation	Utilities $/hr	All industries $/hr	Utilities/ Average
Electrical engineers	$ 35.60	$ 34.43	103%
First-line supervisors/managers of production and operating workers	$ 33.29	$ 21.51	155%
First-line supervisors/managers of mechanics, installers, and repairers	$ 31.70	$ 24.20	131%
Electrical and electronics repairers, powerhouse, substation, and relay	$ 26.33	$ 25.86	102%
Power plant operators	$ 25.94	$ 25.26	103%
Electrical power-line installers and repairers	$ 25.17	$ 23.61	107%
Control and valve installers and repairers, except mechanical door	$ 24.44	$ 21.01	116%
Maintenance and repair workers, general	$ 22.29	$ 14.77	151%
Customer service representatives	$ 16.60	$ 12.99	128%
Meter readers, utilities	$ 15.90	$ 14.15	112%

The next comparison was made between types of utilities: electric, water, and natural gas. Overall the electric utilities paid five percent more per hour than the natural gas distribution industry. The overall paychecks for natural gas employees were slightly higher due to more hours worked per week.

Industry segment	Earnings		Weekly hours
	Weekly	Hourly	
Total, private industry	$ 529	$15.67	33.7
Non-government utilities	$ 1049	$ 25.62	40.9
Natural gas transmission and distribution	$ 1089	$ 25.32	43.0
Electric power generation, transmission, and distribution	$ 1074	$ 26.49	40.5
Water, sewage, and other systems	$ 714	$ 18.30	39.0

DEVELOPMENT

KNOWLEDGE MANAGEMENT

A definition of knowledge management is the range of practices used to preserve, create, and leverage the intellectual capital (tacit and explicit knowledge) in an organization.

Common Objectives	Sample Methods
Standardize operations	• Document processes, policies, and procedures • Provide standard tools, templates, and samples • Video demonstration of procedures or approved methods
Share best practices	• Posting of best practices • Communities of practice • Online collaboration or conference call forums • Links to external libraries/benchmarking organizations
Prevent knowledge loss	• Mentoring/job shadowing • Knowledge fairs/symposiums • Written scenarios • Performance support tools (process documentation, job aids, decision trees, etc.) • Action learning projects • Decision tools
Increase efficiency and Reduce duplication of effort	• Searchable document (reports, analyses, lessons learned, etc.) repository • Databases and directories • Project notebooks • Tools and templates
Improve the quality or speed of decisions	• Searchable document repository • Internal and external databases • “Expert” network/searchable personnel profiles • Search engines • Access to financial and performance data • Enterprise resource planning (ERP), customer relationship management (CRM), etc. • Product/market/competitive information • Decision-making software

MAINTAINING THE WORKFORCE

To research attrition causes and retention methods, we reviewed:

- Reasons people leave or stay in a position
- Attrition and job satisfaction
- Causes of job satisfaction or dissatisfaction
- Performance-based compensation
- Training's affect on retention

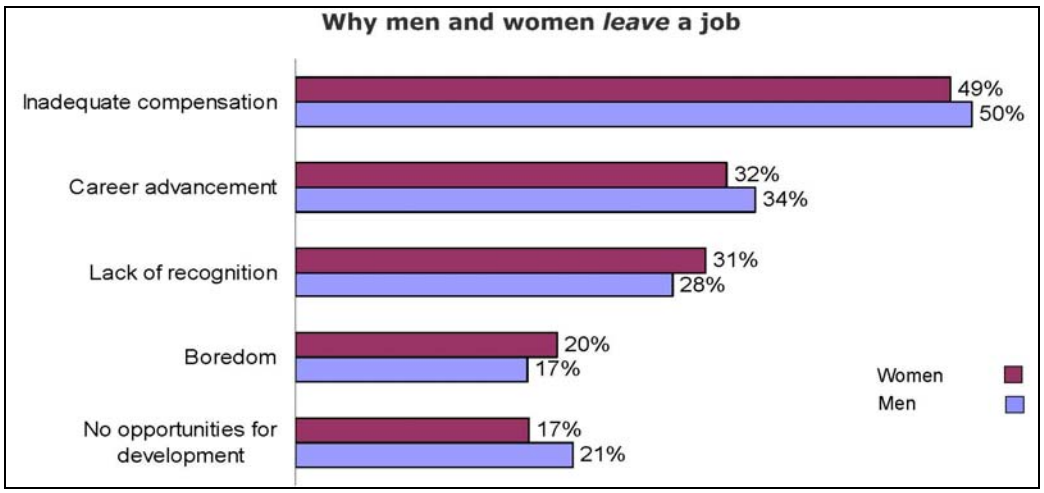
The purpose of this research was to better understand how to retain employees without necessarily increasing their compensation.

ATTRITION AND RETENTION

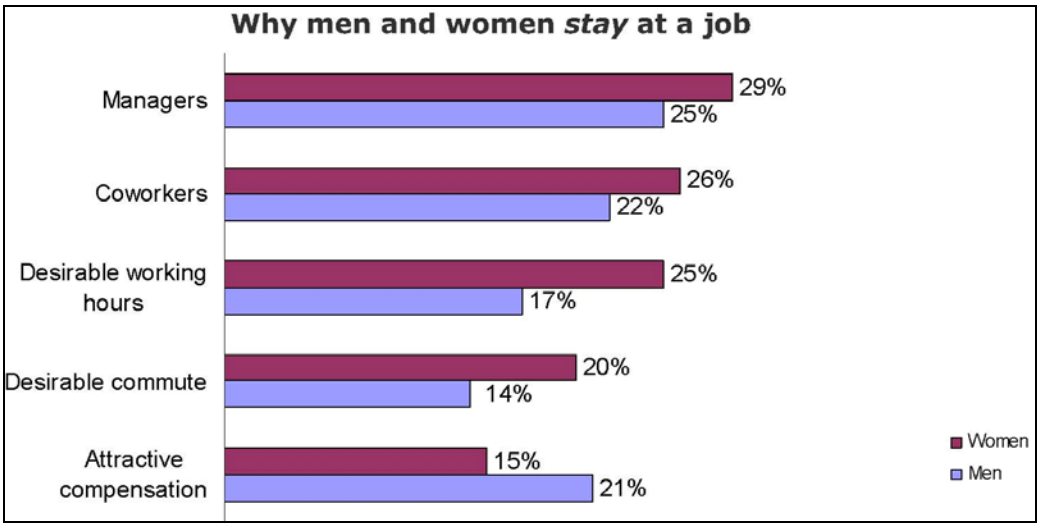
According to Salary.com's 2006/2007 Employee Satisfaction Survey:

- Sixty-two percent of all employees are looking for new jobs.
- Employees most likely to leave have 3 to 10 years of tenure.
- Thirty-three percent of employees report that they are paid a fair market rate, 15 percent report being overpaid and 52 percent of employees say they are underpaid.
- Sixty percent of "underpaid" workers are paid fairly for their job duties, but have inflated job titles.

Employees leave jobs for compensation and career reasons.



Those that stay are mainly satisfied by the environmental factors.



Men and older workers are less likely to change jobs to increase pay. Men required more money to change jobs in hourly fields, expecting a 30 percent pay increase to make a move versus a 24 percent increase for women.

Workers aged 55 years or older make particularly loyal employees:

- Fifty percent do not believe it is necessary to change jobs for better pay and advancement opportunities versus 37 percent for all hourly workers.
- Seventy-seven percent feel loyalty toward their employer.
- Only 50 percent are driven by pay and benefits versus:
  - Eighty percent of 18- to 24-year-olds
  - Seventy-seven percent of 25- to 34-year-olds
  - Seventy percent of 35- to 44-year-olds
  - Sixty-eight percent of 45- to 54-year-olds

RETENTION LITERATURE REVIEW

JOB SATISFACTION

According to Bond and Bunce (2003), the ability to accept and experience various feelings and physiological sensations was a good predictor of positive mental health and job satisfaction. Basically, it can be looked at as a personality trait that can be understood as “a level of openness” and how willing one is to experience new facets of the work atmosphere. A high level of acceptance gave a person more control over his or her job and perceived stress levels.

According to Wallgren and Hanse (2007), the demands or characteristics of the job tend to be accurately perceived by the employee, thus creating a realistic level of perceived stress. With these accurate perceptions, employees are better able to maintain job control. Certain motivators (responsibility, possibility of growth, and achievement) were related to decreased levels of perceived stress.

A work-related social support system is significantly related to job satisfaction (Ferrie, Head, and Rydstedt; 2006). However, the demands of a job do not have a bearing on the structure of the social support; it seems that for a wide range of demands, a work-related social support system still influences job satisfaction.

- Employees with a higher level of job control also had a stronger work-related social support system.
- Employees with a stronger work-related social support system had higher levels of job satisfaction.

De Cuyper and De Witte (2006) studied the differences between employees contracted on a temporary basis vs. a permanent position, and how these contract differences can influence job satisfaction. The difference in contract position did not affect the level of autonomy that an employee exhibits, which is a factor that contributes to job satisfaction. The occupational position itself, as well as workload, did influence the level of autonomy.

Interestingly, the results of the study showed that permanent employees usually have lower levels of job satisfaction than temporary employees, at least in this sample population. This result coincides with other similar studies (Galup, Saunders, Nelson, and Cerveny, 1997; McDonald and Makin, 2000).

Fernet, Guay, and Senecal (2002) studied the influence of job control on burn-out rates by breaking down burn-out into three components:

1. **Emotional exhaustion** simply refers to the decrease in emotional resources to cope with the everyday stressors of the job demands. Having a good sense of job control will help moderate the potentially unhealthy effects of high job demands, thus decreasing levels of emotional exhaustion.
2. **Depersonalization** refers to a detached attitude that is used by employees towards coworkers; it is used as a coping mechanism for the stress that may be arise from interactions with the coworkers. Job control also decreased levels of depersonalization for employees who also had high levels of work self-determination.
3. **Reduced personal accomplishment** refers to a decrease in feelings of competence and productivity of the employee while at work. Job control can increase the feelings of personal accomplishment, especially when the job demands are high and the employee experiences a high level of work self-determination.

JOB STRESSORS/DEMANDS AND RETENTION

While studying American manufacturing workers, Beehr, Glaser, Canali, and Wallwey (2001) reported a positive relationship between employee job demands and job satisfaction and a negative relationship between these same job demands and employee intentions to leave the organization.

In another study of manufacturing employees, Dwyer and Ganster (1991) reported that quantitative workload was positively related to job satisfaction and negatively related to voluntary absences.

As a final example, Cavanaugh, Boswell, Roehling, and Boudreau (2000) found that managers' reports of challenge-related work stressors were positively related to their job satisfaction and unrelated to voluntary turnover.

Why the counterintuitive result? Researchers have found that stressors that people tend to appraise as potentially promoting their personal growth and achievement (commonly referred to as challenge stressors) should be distinguished from stressors that people tend to consider potentially constraining to their personal development and work-related accomplishments (known as hindrance stressors).

These two types of stressors are differentially associated with employee job attitudes (job satisfaction and loyalty), cognitions such as intentions to leave and intention to quit, and behaviors such as job search and task performance.

- Boswell, Olson-Buchanan, and LePine (2004) found that an individual's perception of challenge correlated positively with challenge stress and loyalty and it correlated negatively with job search and work withdrawal behaviors. Specifically, hindrance-related stress was associated with less loyalty, increased job search and intent to quit, while challenge-related stress was associated with enhanced loyalty, less withdrawal, job search, intent to quit.
- Cavanaugh, Boswell, Roehling, and Boudreau (2000) found that challenge-related self-reported stress is positively related to job satisfaction and negatively related to job search. In contrast, hindrance-related self-reported stress is negatively related to job satisfaction and positively related to job search and turnover.
- LePine, Podsakoff, and LePine (2005) found that hindrance stressors had dysfunctional relationships with these criteria (negative relationships with job satisfaction and organizational commitment and positive relationships with turnover intentions, turnover, and withdrawal behavior). Relationships with challenge stressors were generally the opposite (positive relationships with job satisfaction and organizational commitment and negative relationships with turnover intentions and turnover).

These associations suggest stress may work through feelings of challenge to predict work outcomes.

Despite some support for this two-dimensional work stressor framework, there has been no attempt to integrate it with theory that could be used as a basis for explaining relationships among the two types of stressors and various types of retention variables or criteria.

PERFORMANCE AND PAY

Data from human resource records suggest that high performers are most likely to leave an organization if performance does not lead to sufficient financial rewards (Trevor, Gerhart, and Boudreau, 1997). Low performers are more likely to stay put if relationships between pay and performance are weak (Harrison, Virick, & William, 1996). Pay for Performance (PFP) employees receive increased compensation for their work when certain targets are reached. Lazear (2000) used field data to examine both sorting and incentive effects and found that PFP resulted in a 44 percent increase in productivity.

Cable and Judge (1994) found through self-report questionnaire data that risk attitudes influenced sorting choices and choices of pay structure. PFP is a less popular option for more risk-averse employees. Deckop, Merriman and Blau (2004) demonstrated by means of a survey study that individual levels of risk aversion influence the effects of their "control by-pay" measure on withdrawal, contingent pay satisfaction, and organizational citizenship behavior.

It is generally believed that PFP attracts higher-quality employees, while motivating employees to exert more effort.

TRAINING AND COMMITMENT

Training increases capability and commitment, in addition to maintaining a skilled workforce in the presence of changing technologies and attrition.

Alleyne, Kakabadse, and Kakabadse (2007) found that when participants/employees engaged in effective communication concerning information about new technology, the managers' perceptions of satisfaction with human resources intranet and human resources function were influenced. New technology refers to training, marketing, user involvement, and feedback.

Beas and Salanova (2006) found that employees with a high positive attitude towards information computer technology (ICT) had increased levels of professional self-confidence. Employees with low levels of positive attitudes towards ICT experience a decrease in professional self-confidence. However, this latter result did depend on the number of training hours of the employees. The more the training hours, the more self-confidence the employee felt.

Zimmerman and colleagues (2005) found that, when studying workers in a clinical environment, providing additional training for employees who demonstrated job commitment lessened their tendency to become burned-out or to seek outside job opportunities.

Lowry, Simon, and Kimberly (2002) found that employees' levels of job commitment and satisfaction depend on their perceptions of work context factors. Work context factors refer to training, promotion, work scheduling, management practices, and social integration.

The authors make the suggestion for enterprises to make their employees aware of additional training opportunities and options for developing career paths to better their performances.

PHASED RETIREMENT

An AARP article discusses phased retirement for employees in the 50 to 70 age range. Citing a 2004 Watson Wyatt & Company study:

"When asked how they would like to phase, many older workers said they hope to work part-time (63 percent) or work more flexible hours (48 percent) before retiring completely. Nearly two-thirds (63 percent) of current workers aged 50 and older indicated that they would like to phase-in an entirely different career. Among current phasers, 80 percent work flexible hours and 79 percent work part-time. Two-thirds (67 percent) have less responsibility in their current job compared with their career job."

COST OF ATTRITION

A Towers-Perrin (2005) study found that the cost of attrition averages 1.5 times the base salary for exempt employees, with a median of $96K. Beyond replacement costs, some additional costs and impacts of attrition are:

- Lower productivity
  - For leaving employees as they plan their departure
  - For remaining employees taking over interim duties and training new employees
  - For new employees while they become proficient
- Overtime costs
- Impact on internal and external customers
- Costs for administering the resignation
- Lower morale for remaining employees

SUMMARY

Reducing non-retirement attrition is mainly a matter of increasing job satisfaction. Employees remain in a position for three major reasons:

- Commitment to their jobs (a key indicator of this is job satisfaction)
- Financial responsibilities
- Lack of attractive alternatives

Job satisfaction is increased by:

- Compensation commensurate with position
- Interesting and challenging work

Job satisfaction is decreased by:

- Physically and psychologically straining work environments
- Restricted social opportunities because of long or irregular hours
- Work inhibitors, such as poor policies, bureaucracy, and inadequate resources

Research indicates Pay for Performance increases productivity and high performer retention.

Training increases capability and commitment, in addition to maintaining a skilled workforce in the presence of changing technologies and attrition.

Average cost of attrition is 1.5 times the annual salary for exempt employees.

APPENDIX D – RESOURCES

PROFESSIONAL ASSOCIATIONS

There are a number of associations and professional societies that represent the industries and employees involved in the natural gas pipeline transmission.

Trade Associations - Natural Gas

1. American Gas Association (AGA)
2. Interstate Natural Gas Association of America (INGAA)
3. Natural Gas Supply Association (NGSA)
4. Southern Gas Association (SGA)

Trade Associations - Pipelines and Utilities

5. American Petroleum Institute (API)
6. Association of Oil Pipelines (AOPL)
7. Canadian Association of Petroleum Producers (CAPP)
8. Canadian Energy Pipeline Association (CEPA)
9. Center for Energy Workforce Development (CEDW)
10. Independent Petroleum Association of America (IPAA)
11. International Pipeline and Offshore Contractors Association (IPLOCA)
12. Midwest Energy Association (MEA)
13. National Petroleum Council (NPC)
14. Pipe Line Contractors Association (PLCA)

Trade Associations - General

15. American Concrete Institute (ACI)
16. American Institute of Steel Construction (AISC)
17. Institute for Supply Management (ISM)
18. NACE International - The Corrosion Society
19. The Society for Protective Coatings (SSPC)

Skilled Trade Associations and Unions

20. International Union of Operating Engineers (IUOE)
21. International Association of Bridge, Structural, Ornamental and Reinforcing Iron Workers IW (www.ironworkers.org)
22. International Association of Machinists and Aerospace Workers (IAMAW)
23. International Brotherhood of Boilermakers, Iron Ship Builders, Blacksmiths, Forgers and Helpers (www.boilermakers.org)
24. International Brotherhood of Electrical Workers (IBEW) (www.ibew.org)
25. Laborers' International Union of North America (LIUNA)

26. Maintenance and Construction Skilled Trades Council (MCSTC)
27. Pipeliners Association of Houston
28. United Association of Plumbers and Pipefitters (UA)
29. United Steelworkers of America (USWA)
30. United Association of Journeymen and Apprentices of the Plumbing, Pipefitting and Sprinkler Fitting Industry of the United States and Canada UA
31. Utility Workers Union of America UWUA (www.uwua.org)

News Organizations

32. CE News Online
33. Engineering News-Record - ENR
34. Hydrocarbon Engineering
35. Oil & Gas Journal
36. Petroleum Economist
37. Petroleum News
38. Pipeline News
39. The Journal of Pipeline Integrity
40. Trenchless Technology
41. World Energy News

Government Organizations and Standards

42. American Society for Testing and Materials (ASTM) International
43. DOT - Office of Pipeline Safety
44. National Pipeline Mapping System (PIMMA)
45. Office of Pipeline Safety Integrity Management
46. Pipeline Open Data Standards (PODS)

Professional Societies - Degreed

47. American Society of Civil Engineers (ASCE)
48. American Institute of Chemical Engineers (ACHE)
49. American Society of Mechanical Engineers (ASME)
50. Institute of Electrical and Electronics Engineers (IEEE)
51. Instrumentation, Systems, and Automation Society (ISA)
52. Association for the Advancement of Cost Engineering International
53. Association of Professional Engineers, Geologists and Geophysicists of Alberta (APEGGA)
54. Association of Professional Engineers & Geoscientists of Saskatchewan (APEGS)
55. Canadian Society of Professional Engineers (CSPE)
56. International Federation of Professional and Technical Engineers IFPTE (www.ifpte.org)

DEPARTMENT OF LABOR

The following information was obtained from the Department of Labor's Office of Apprenticeship:

The Office of Apprenticeship (OA) is responsible for developing materials and conducting a program of public awareness to secure the adoption of training in skilled occupations and related training policies and practices used by employers, unions, and other organizations; developing policies and plans to enhance opportunities for minority and female participation in skilled training; and coordinating the effective use of Federal, labor, and resources to create a clear training-to-employment corridor for customers of the workforce development system. OA engages in partnership activities, ensuring quality service and customer satisfaction.

Setting Up An Apprenticeship Program

Registered apprenticeship is a voluntary industry-driven training program. The registered apprenticeship program can be a partnership of business and organized labor as the primary operators of programs, or implemented by employers or employer associations. Government plays a support role. The Office of Apprenticeship provides technical consultation services on the development of apprenticeship standards.

Employers or groups of employers and unions design, organize, manage, and finance registered apprenticeship programs under a set of apprenticeship standards, which include an on-the-job training outline, related classroom instruction curriculum and the apprenticeship operating procedures. These standards are then registered with the OA or an OA recognized State Apprenticeship Agency. OA provides apprenticeship services in all States, and registers programs and apprentices in the 23 States where there is no SAC or Agency.

High Growth Grants for Construction Trades

Investments as of December 31, 2006: $35,134,804 in nine grants.

Since February 2003, the Department of Labor (DOL) announced the award of nine investments totaling over $35 million to address the workforce needs of the construction industry. Through multiple forums, ETA has listened to employers, industry associations, and others in the construction industry regarding their efforts to identify challenges and implement effective workforce strategies. ETA has worked with the construction industry to identify its hiring, training, and retention challenges.

SKILLED TRADE EDUCATIONAL INSTITUTES

The information gathered reflects relevant characteristics of higher education institutions (community colleges, technical schools, etc.) offering training programs for the specific jobs of interest (i.e., Pipefitters and Heavy Equipment Operators). These institutions were identified using CareerInfo.net, a website sponsored by the U.S. Department of Labor.

Once all institutions offering the programs of interest were identified, the institutions' characteristics (location, duration, cost, night school, on-line, number of awards granted, financial assistance) were analyzed and compiled using the Colleges Opportunity On-line Locator (COOL), a website maintained and operated by the U.S. Department of Education: http://nces.ed.gov/ipeds/cool/index.aspx. This website also provided access to the web pages of the institutions. Characteristics not listed on the COOL website (such as online, night school options and duration of program) were found through the institutions' websites. If the information could not be determined, the table cell was left blank.

- The "number of awards" is listed according to the sum of associate's degrees and certificates granted during the 2005-2006 academic year by the institution (associate's degrees + certificates = awards granted).
- The "night school" and "on-line" characteristics are listed according to whether or not the options are offered by the institution.
- The "cost" of attendance is listed as the in-state tuition for a full time student per academic year or duration of the program, if less than a year.
- The "duration" is listed as the estimated amount of time to completion of the given program.
- The "apprenticeship" is listed according to whether the program is employer-related (the employer pays for the program on behalf of the participant).
- The "funding options" is listed as the different types of financial assistance provided to the entire student body of the institution. F = Federal, S = State, L = Local, IG = Institutional grant or loan
- The "percent receiving funding" is listed as the percent of the entire student body that received any type of financial assistance.

PIPELAYERS AND PIPEFITTERS

School	Location		Cost	Number of Awards	Funding Options	% Funded
Ilisagvik College	Barrow	AK	$1,540	3	F/S/L/IG	76%
Bishop State Community College	Mobile	AL	$2,160	11	F/S/L/IG	91%
George C Wallace Community College - Dothan	Dothan	AL	$2,700	9	F/S/LG	67%
J F Ingram State Technical College	Deatsville	AL	$2,130	3	S/LG	100%
Lawson State Community College - Birmingham Campus	Birmingham	AL	$2,700	6	F/S/L/IG	89%
Central Arizona College	Coolidge	AZ	$1,422	102	F/S/L/IG	46%
Gateway Community College	Phoenix	AZ	$6,054	19	F/S/L/IG	79%
City College of San Francisco	San Francisco	CA	$710	3	F/S/LG/L	46%
College of San Mateo	San Mateo	CA	$508	15	F/S/LG	30%
Foothill College	Los Altos Hills	CA	$833	43	F/S/L/IG	22%
Los Angeles Trade Technical College	Los Angeles	CA	$698	18	F/S/LG	78%
National Institute of Technology	Long Beach	CA	$15,519	298	FG/L	79%
San Diego City College	San Diego	CA	$650	42	F/S/L/IG	66%
Wyo Tech	Fremont	CA	$24,575	10	F/S/LG/L	77%
Industrial Management Training Institute	Waterbury	CT	$13,730	19	FG/L	76%
Daytona Beach Community College	Daytona Beach	FL	$2,103	14	F/S/L/IG	61%
Florida Community College at Jacksonville	Jacksonville	FL	$1,714	5	F/S/L/IG	62%
Hillsborough Community College	Tampa	FL	$2,380	8	F/S/L/IG	57%
Indian River Community College	Fort Pierce	FL	$1,756	1	F/S/L/IG	57%
Lee County High Tech Center Central	Fort Myers	FL	$2,804	7	F/S/L/IG	41%
Manatee Technical Institute	Bradenton	FL	$3,496	7	F/S/L/IG	31%
Altamaha Technical College	Jesup	GA	$1,359	2	F/S/L/IG	88%
Atlanta Technical College	Atlanta	GA	$1,362	18	F/S/LG	94%
Kirkwood Community College	Cedar Rapids	IA	$2,970	9	F/S/L/IG	82%
Southwestern Illinois College	Belleville	IL	$1,764	1	F/S/L/IG	46%
Ivy Tech Community College - Central Indiana	Indianapolis	IN	$2,713	35	F/S/L/IG	64%
Ivy Tech Community College - Kokomo	Kokomo	IN	$2,713	1	F/S/L/IG	76%
Ivy Tech Community College - Northcentral	South Bend	IN	$2,713	32	F/S/L/IG	75%
Ivy Tech Community College - Northeast	Fort Wayne	IN	$2,713	17	F/S/L/IG	71%
Ivy Tech Community College - Southwest	Evansville	IN	$2,713	8	F/S/L/IG	76%

School	Location		Cost	Number of Awards	Funding Options	% Funded
Ivy Tech Community College - Wabash Valley	Terre Haute	IN	$2,713	37	F/S/L/IG	73%
Jefferson Technical College	Louisville	KY	$2,616	42	F/S/LG/L	77%
Madisonville Community College	Madisonville	KY	$2,616	1	F/S/L/IG	90%
Northern Maine Community College	Presque Isle	ME	$2,940	12	F/S/L/IG	89%
Southern Maine Community College	South Portland	ME	$2,880	12	F/S/LG/L	61%
Washington County Community College	Calais	ME	$3,278	17	F/S/L/IG	82%
Kalamazoo Valley Community College	Kalamazoo	MI	$3,100	1	F/S/L/IG	63%
Macomb Community College	Warren	MI	$3,264	22	F/S/L/IG	42%
Washtenaw Community College	Ann Arbor	MI	$2,784	29	F/S/L/IG	61%
Washtenaw Community College	Ann Arbor	MI	$2,784	29	F/S/L/IG	61%
Anoka Technical College	Anoka	MN	$4,464	27	F/S/L/IG	67%
Minnesota State Community and Technical College	Fergus Falls	MN	$4,826	32	F/S/L/IG	81%
Minnesota West Community and Technical College	Granite Falls	MN	$4,464	24	F/S/L/IG	83%
Northland Community and Technical College	Thief River Falls	MN	$4,960	10	F/S/L/IG	85%
Northwest Technical College	Bemidji	MN	$4,490	1	F/S/L/IG	83%
Saint Cloud Technical College	Saint Cloud	MN	$4,302	22	F/S/L/IG	67%
Saint Paul College - A Community and Technical College	Saint Paul	MN	$3,836	98	F/S/L/IG	67%
Summit Academy Opportunities Industrialization Center	Minneapolis	MN	$4,500	18	F/S/L/IG	63%
Ranken Technical College	Saint Louis	MO	$10,600	27	F/S/L/IG	74%
Saint Louis Community College - Forest Park	Saint Louis	MO	$3,090	2	F/IG	82%
Vatterott College	Saint Ann	MO	$10,530	30	F/S/LG/L	100%
Blue Ridge Community College	Flat Rock	NC	$1,264	11	F/S/L/IG	57%
Cleveland Community College	Shelby	NC	$1,302	13	F/S/L/IG	50%
Fayetteville Technical Community College	Fayetteville	NC	$1,324	8	F/S/L/IG	77%
Forsyth Technical Community College	Winston Salem	NC	$1,336	7	F/S/L/IG	26%
Halifax Community College	Weldon	NC	$1,186	17	F/S/L/IG	61%
Johnston Community College	Smithfield	NC	$1,334	37	F/S/L/IG	48%
North Dakota State College of Science	Wahpeton	ND	$3,757	11	F/S/L/IG	80%
Adult & Continuing Education - BCTS	Hackensack	NJ	$9,460	17	F/S/LG/L	64%
Berk Trade and Business School	Brooklyn	NY	$7,475	43	FG/L	95%
Harlem School of Technology	New York	NY	$10,100	16	FG/L	80%

School	Location		Cost	Number of Awards	Funding Options	% Funded
SUNY College of Technology at Alfred	Alfred	NY	$5,406	7	F/S/L/IG	92%
SUNY College of Technology at Delhi	Delhi	NY	$5,329	23	F/S/L/IG	86%
Mid-Del Technology Center	Midwest	OK	$1,825	2	F/IG	49%
Tulsa Technology Center - Lemley Campus	Tulsa	OK	$3,650	7	F/IG	49%
Community College of Allegheny County	Pittsburgh	PA	$4,849	22	F/S/L/IG	51%
Delaware County Community College	Media	PA	$6,100	19	F/S/L/IG	33%
Lancaster County Career and Technology Center	Willow Street	PA	$8,431	2	FG/L	70%
Lebanon County Area Vocational Technical School	Lebanon	PA	$5,700	4	FG/L	93%
Luzerne County Community College	Nanticoke	PA	$5,400	5	F/S/L/IG	62%
Orleans Technical Institute	Philadelphia	PA	$8,538	25	F/S/L/IG	94%
Pennsylvania College of Technology	Williamsport	PA	$10,620	8	F/S/L/IG	75%
Schuylkill Technology Centers	Frackville	PA	$9,270	8	F/S/L/IG	99%
Thaddeus Stevens College of Technology	Lancaster	PA	$5,420	12	F/S/L/IG	74%
New England Institute of Technology	Warwick	RI	$16,245	31	F/S/L/IG	88%
Brazosport College	Lake Jackson	TX	$1,542	2	F/S/L/IG	56%
Lee College	Baytown	TX	$1,654	11	F/S/L/IG	46%
St Philips College	San Antonio	TX	$2,836	8	F/IG	80%
Ogden-Weber Applied Technology College	Ogden	UT	$1,785	13	F/S/L/IG	42%
Salt Lake Community College	Salt Lake City	UT	$2,404	16	F/S/L/IG	85%
Blackhawk Technical College	Janesville	WI	$2,781	7	F/S/LG/L	65%
Chippewa Valley Technical College	Eau Claire	WI	$3,913	1	F/S/L/IG	66%
Gateway Technical College	Kenosha	WI	$2,781	13	F/S/LG/L	47%
Lakeshore Technical College	Cleveland	WI	$2,794	8	F/S/L/IG	55%
Mid-State Technical College	Wisconsin Rapids	WI	$2,852	7	F/S/L/IG	69%
Milwaukee Area Technical College	Milwaukee	WI	$2,886	45	F/S/L/IG	54%
Moraine Park Technical College	Fond Du Lac	WI	$2,856	19	F/S/L/IG	54%
Nicolet Area Technical College	Rhinelander	WI	$3,325	4	F/S/L/IG	60%
North Central Technical College	Wausau	WI	$2,806	6	F/S/LG/L	59%
Southwest Wisconsin Technical College	Fennimore	WI	$2,864	4	F/S/L/IG	80%
Western Wisconsin Technical College	La Crosse	WI	$2,835	1	F/S/L/IG	43%
Wisconsin Indianhead Technical College	Shell Lake	WI	$2,784	25	F/S/L/IG	77%
Carver Career Center	Charleston	WV	$5,993	4	F/S/L/IG	80%

HEAVY EQUIPMENT OPERATORS

School	Location		Night school	On-line	Cost	Duration	Appren ticeship	Number of Awards	Funding Options	Percent Receiving Funding
Shelton State Community College	Tuscaloosa	AL	no	no	$2,720	1 year	yes	10	F/S/L/IG	59%
North Arkansas College	Harrison	AR	no	no	$1,944	1 year	no	14	F/S/L/IG	86%
Northwest Technical Institute	Springdale	AR	no	no	$2,016	5 months	no	4	F/S/L/IG	63%
Central Arizona College	Coolidge	AZ	no	no	$1,422	1-2 years	no	3	F/S/L/IG	46%
Butte College	Oroville	CA	no	no	$722	1-2 years	yes	55	F/S/L/IG	57%
Washington-Holmes Technical Center	Chipley	FL	no	no	$1,495	1200 hours	no	9	F/S/LG	64%
Mid Florida Tech	Orlando	FL	yes	no	$1,389	450 hours	yes	19	F/S/L/IG	11%
Northwest Iowa Community College	Sheldon	IA	yes	no	$3,810	4 year	yes	19	F/S/L/IG	84%
Southeast Kentucky Community and Technical College	Cumberland	KY	no	no	$2,760	1 year	yes	8	F/S/L/IG	94%
Hazard Community and Technical College	Hazard	KY	yes	no	$2,616	1 year	yes	6	F/S/L/IG	96%
Washington County Community College	Calais	ME			$3,278		yes	15	F/S/L/IG	82%
Lansing Community College	Lansing	MI	yes	no	$2,060	8 weeks	no	23	F/S/L/IG	66%
Central Lakes College - Brainerd	Brainerd	MN	yes	no	$4,238	2 year	yes	56	F/S/L/IG	76%
Linn State Technical College	Linn	MO	yes	no	$4,710	3 year	yes	54	F/S/L/IG	88%

School	Location		Night school	On-line	Cost	Duration	Apprenticeship	Number of Awards	Funding Options	Percent Receiving Funding
Mississippi Delta Community College	Moorhead	MS	no	no	$1,920	1 year	no	5	F/S/L/IG	84%
Copiah-Lincoln Community College	Wesson	MS	no	no	$1,820	16 weeks	yes	4	F/S/L/IG	90%
The University of Montana	Missoula	MT	yes	yes	$4,978	1 year	yes	6	F/S/L/IG	74%
Wilson Technical Community College	Wilson	NC	no	no	$1,302	18 hours	no	8	F/S/L/IG	82%
Schuylkill Technology Centers	Frackville	PA	yes	no	$7,016	1080 hours	yes	5	FG/L	99%
Central Pennsylvania Institute of Science and Technology	Pleasant Gap	PA	yes	no	$8,665	608 hours	yes	13	F/S/L/IG	93%
Brazosport College	Lake Jackson	TX	yes	no	$1,038	2 years	yes	2	F/S/L/IG	56%
Bates Technical College	Tacoma	WA	yes	no	$3,859	1 year	yes	89	F/S/L/IG	37%

APPENDIX E – SUGGESTED ACTIONS

During the course of the project, actions were suggested by executives, managers, and steering team members. All suggestions were captured, and those included in the roadmaps are noted with their roadmap name shown in parentheses.

Supply Strategy – Increase awareness of the industry to make natural gas transmission careers attractive to students and the general public.

- Industry marketing plan with "branding" (supply)
- Career media campaigns (supply)
- Fund college competitions
- Support chairs at colleges
- K-12 awareness programs
- Junior and senior high school outreach programs (supply)
- Secondary school career introduction materials (supply)

Supply Strategy – Increase opportunities for technical training relevant to the natural gas transmission industry.

- Retraining of displaced workers
- Government grants and subsidies (supply)
- Department of Labor communications (supply)
- Scholarship program (supply)
- University partnerships
- Standardized curriculum (supply)
- Natural gas specific courses (supply)
- Workforce supply planning (overall)

Recruitment Strategy – Design attractive job positions that aid in recruiting and retention.

- Part-time work and flexible schedules (recruit)
- Interesting and engaging job positions (recruit)
- Improved flexible benefits
- Likely candidate needs assessment (recruit)
- Compensation benchmarking (recruit)

Recruitment Strategy – Use the most effective recruitment tools.

- Referral programs (recruit)
- Workforce planning of recruitment needs
- Standard industry orientation – INGAA DVD (recruit)
- Industry sharing of recruitment strategies (recruit)
- Partnership with recruitment company

Develop Strategy – Employ on-going workforce skill development to reach the desired skill and knowledge levels.

- Job task analysis (develop)
- Workforce analysis and training strategy (develop)
- Assess technology impact on skill requirements (develop)
- Training partnerships
- Work/study programs (develop)
- Apprenticeship programs (develop)
- Tuition reimbursement
- Training resource directory (develop)
- Accelerated on-the-job training programs
- Customized training plans (develop)
- Supplemental new-hire training (develop)
- Fundamental knowledge programs (develop)
- Re-qualification program
- Rate cases for training

Develop Strategy - Maintain knowledge assets for use in skill development, process improvement and improving the quality of decisions.

- Best practices (develop)
- Mentoring program (develop)
- Document processes (develop)
- Technical leadership forums/ communities of practice (develop)
- External training resources
- Knowledge management strategy (develop)

Maintain Strategy – Maintain the workforce by delaying retirements and reducing causes of non-retirement attrition.

- Employee satisfaction surveys (maintain)
- Industry sharing of retention strategies (maintain)
- Pension plan
- Phased retirement (maintain)
- Longevity benefits (maintain)
- Exit interviews
- Other types of retention programs
- Promote employment past retirement age (maintain)

Maintain Strategy – Motivate employees with positive work environments and interesting job positions.

- Career development program (maintain)
- Work environment benchmarking (maintain)
- Performance-based incentives (maintain)
- Technical leadership awards
- Immigration assistance
- Industry standards certifications
- Succession planning (maintain)
- Utilize downtime for skill development
- Process improvement
- Level workload

Communications with company leadership about workforce and knowledge issues and actions.

- Executive presentation of study results and roadmaps (overall)

Ensure sufficient time and resources to complete workforce and knowledge roadmap customization and implementation.

- Administration budget formulation and management (overall)

APPENDIX F – REFERENCES

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