

The Aging Workforce Impact on Power Plant Operations

Defining Approaches and Solutions With Low Cost Impacts

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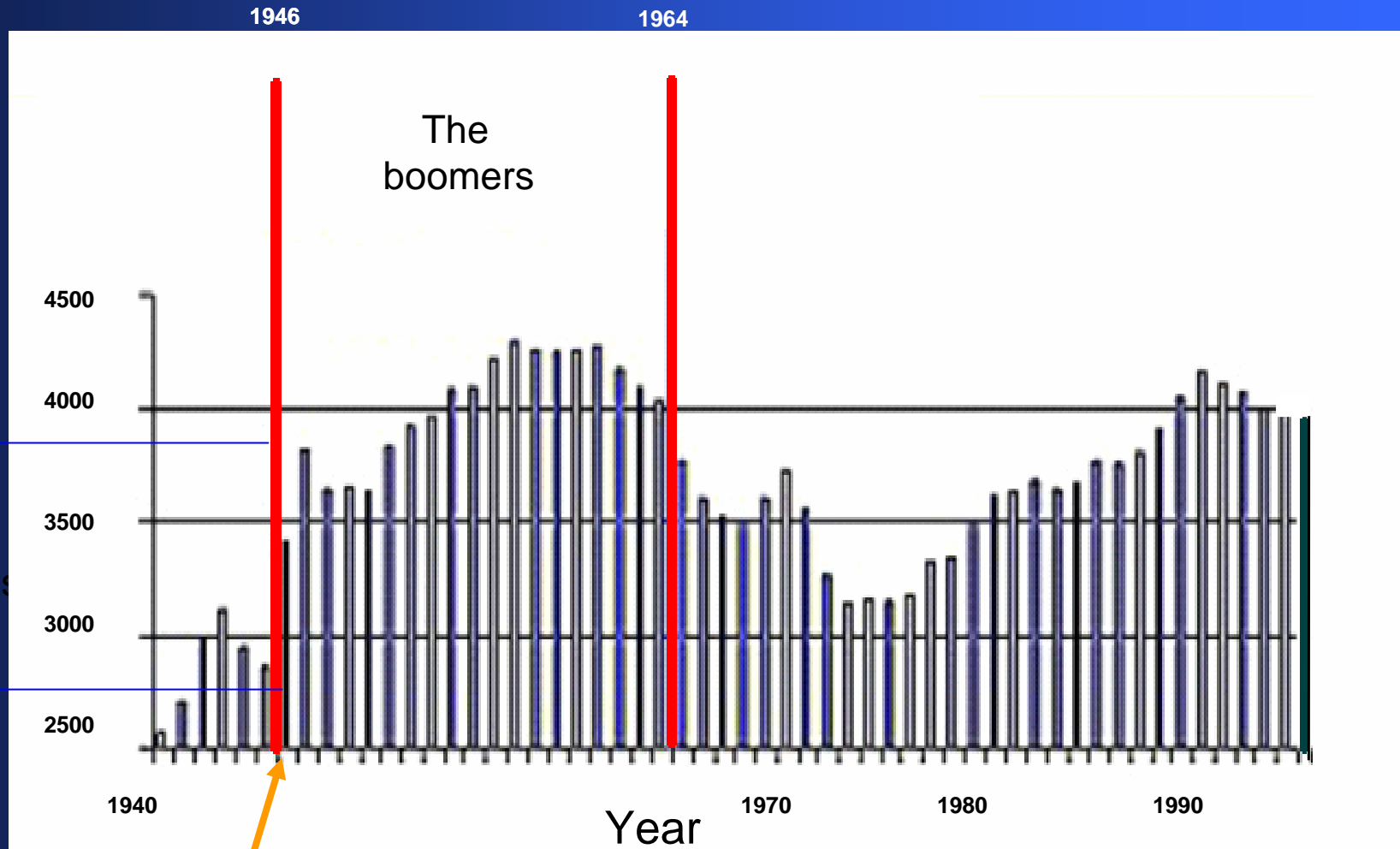
Agenda

- Issue
 - General
 - Power Industry
- Lessons from the Past
- Approaches
- Solutions

Symptoms to Look For

- It is almost a gray-hair jungle in the cafeteria
- You attend more than one retirement party a week or retirement parties cover more than two people
- Promotions leave no one behind to operate the systems and tools
- No one can find the original written basis of a design!
- When the “old timer” you rely on for solutions is no longer there or has become an outside “consultant”
- When you become the retiree!!

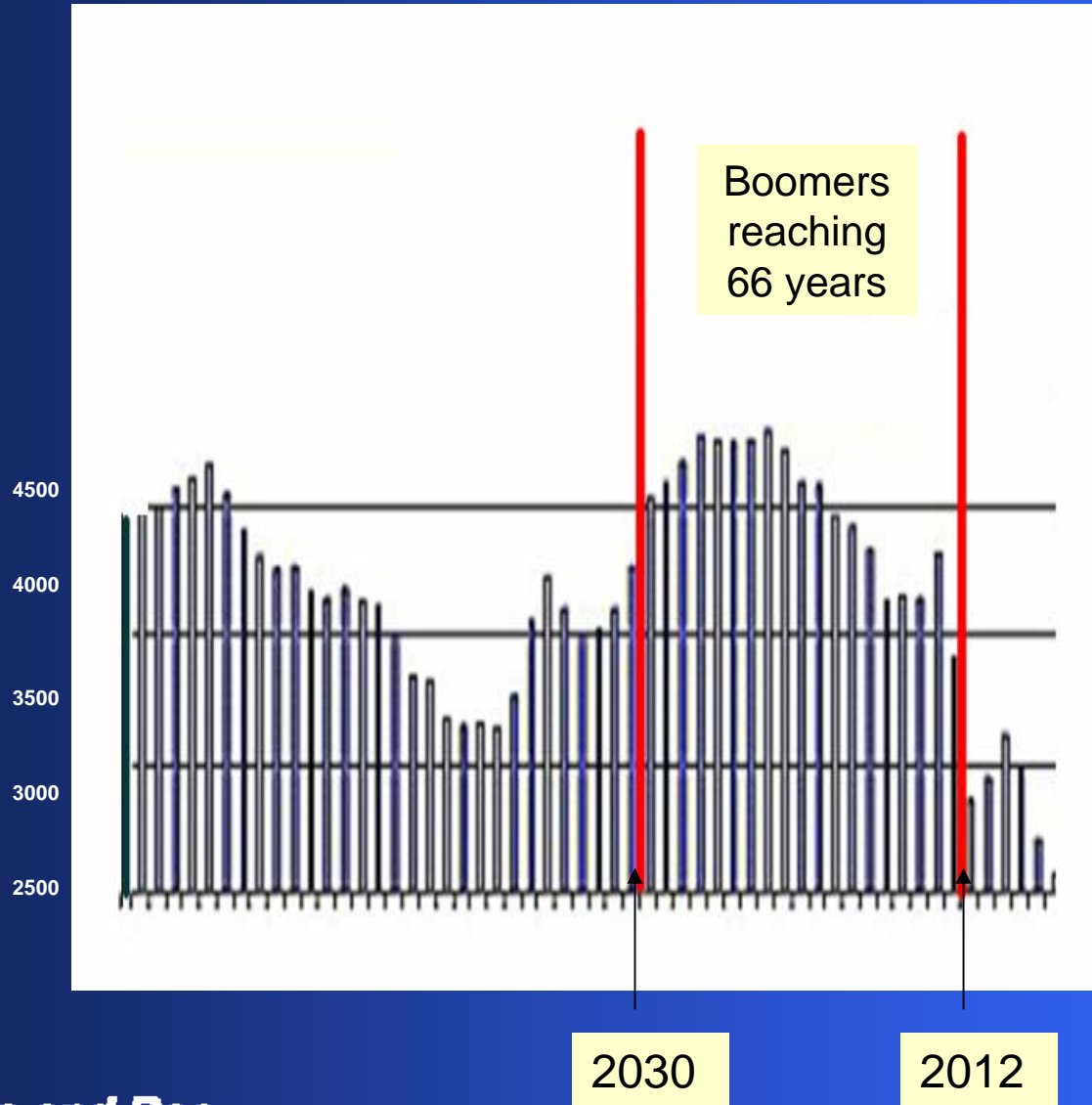
The Boomers



60 in 2006

US Births— 1940 to the 1990s

The Boomer Wave into Retirement



Expect on the average an almost a 50% increase in retirements per year over the prior group

Facts about the power industry

- “About **half the country’s 400,000 electric-utility workers will be eligible to retire over the next five years** says Michael Ashworth, at Carnegie Mellon University in Pittsburgh. And 40% of the manufacturing work force is expected to retire in the next 10 years, the National Association of Manufacturers warns”. *
- “When executives at Platte River Power Authority, an electric company in Fort Collins, Colorado surveyed its employees 18 months ago, **they were stunned by a particular finding: 40% of the company's 200 workers said they intended to retire over the next five years**”. *

*
Bye-Bye Boomers? Companies May Face Exodus As Workers Hit Retiring Age;
Some Bosses Are Afraid to Ask By **KELLY GREENE**
Staff Reporter of **THE WALL STREET JOURNAL** 9/20/05

Facts about the power industry

- The average age of utility craft workers is 50 or older-the highest of any US industry in the US*
- “Organizational leadership will be affected by the retirement of the baby boomers **who make up the largest group of working-age individuals within the utility management today from power plant management, to engineering management to top executives**”*
- In power plants visited during the past 3 years, nearly half the personnel including managers and technicians will be eligible to retire over the next five years
 - Some are planning to replace the personnel with equivalent experienced people, but with the competition for experienced people being so intensive, power **plant managers are finding it hard to find the personnel**
 - Some are now **re-establishing training and apprenticeship programs** to train new personnel to fill in the job openings over time

* Electric Perspectives September, 2005

Other facts

- It affects Canada as well as the US
- Recently, the Los Angeles Times reports there is one engineering niche that is booming. Oil companies are seeking to replace an entire generation of workers who entered the industry during the last oil boom. With pay starting at \$50,000 to \$60,000 a year and a healthy supply of jobs -- a result of booming natural-gas drilling and the wave of retirements in the profession -- enrollment in undergraduate petroleum engineering is up 46% nationwide since 2002 *
- Today people are making the choice to work later
 - Approximately, a quarter to a third of retirees below 70 years have some sort of job
 - The boomers are expected to follow except their retirement jobs will probably not be in the same industry they retired from

* THE MORNING BRIEF By JOSEPH SCHUMAN,
WSJ 11/28/05

The scenario is further aggravated by ...

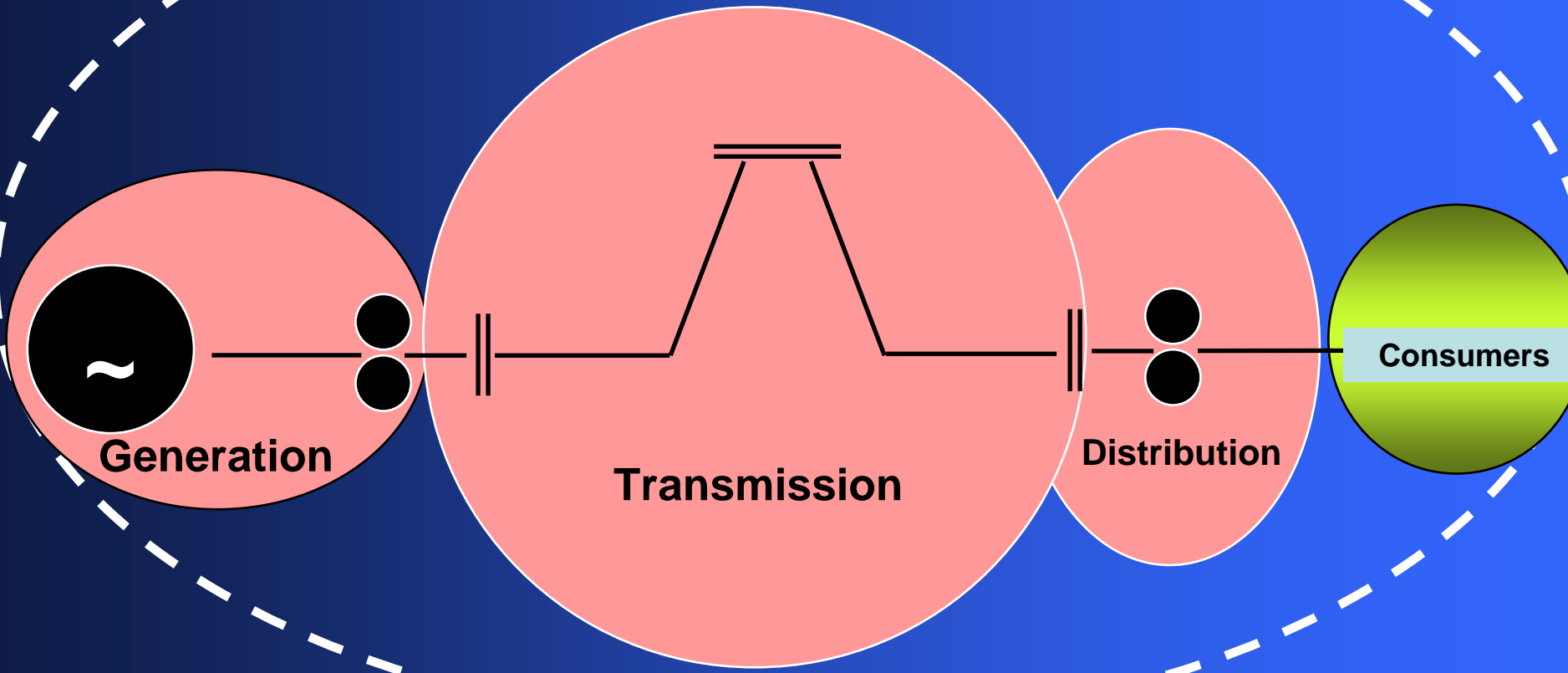
- The number of engineers graduating and coming to the power industry over the past 15 years or so has been a fraction of what it was in the late 1960s and 1970s
- Since the mid 1980s many engineering schools have eliminated or significantly reduced their power industry related courses and programs
 - Lack of interest from incoming students
 - Negative publicity given to fossil and nuclear power plants
 - More attracted to computer and information technologies
 - Lack of funding from the power industry as it evolved
 - Reduced funding of power research programs coming from government sources
- There is a general lack of incentives for engineering graduates and technical trades to consider the power industry as a career

The scenario is further aggravated by ...

- The industry changing radically through competition, consolidations, sales, acquisitions, etc.
- The years past vertically integrated utility concept in the industry changing as a result of deregulation and competition into various types of organizations
- The power industry been in a slump over the past 3 years with fuel prices at their highest ever

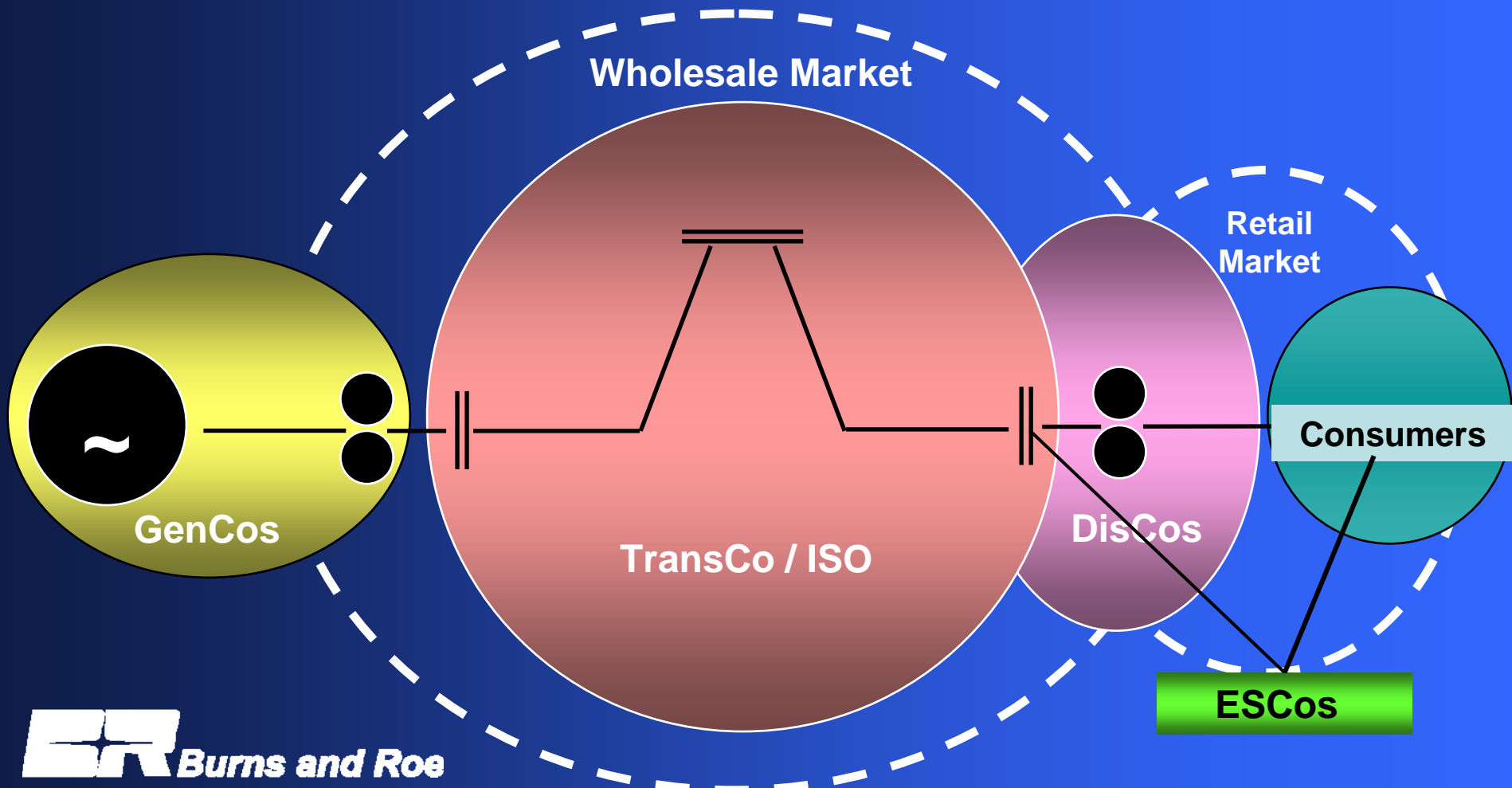
In Regulated States

One Utility Entity-Regulated by State PSC or PUC

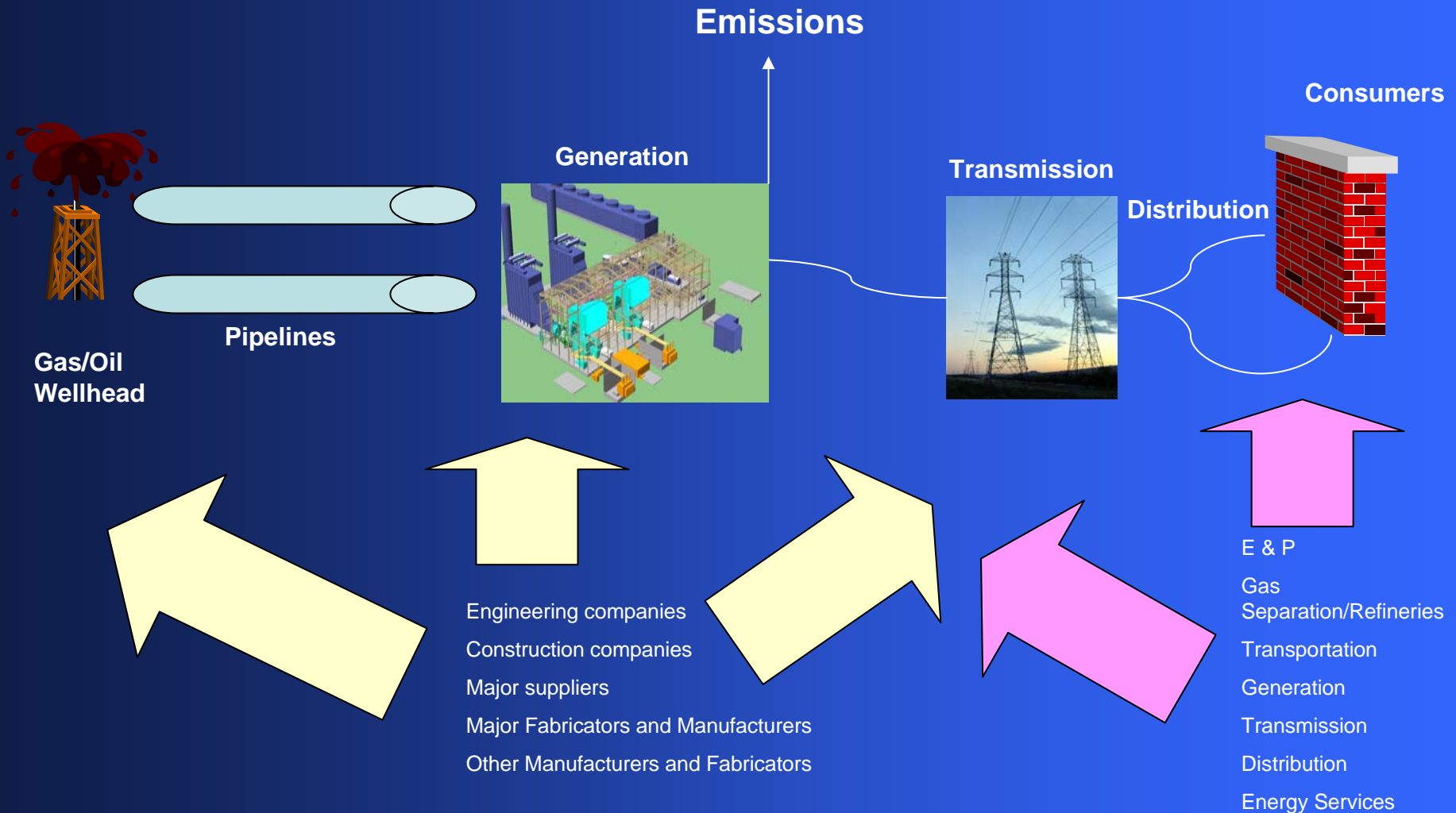


In Deregulated States

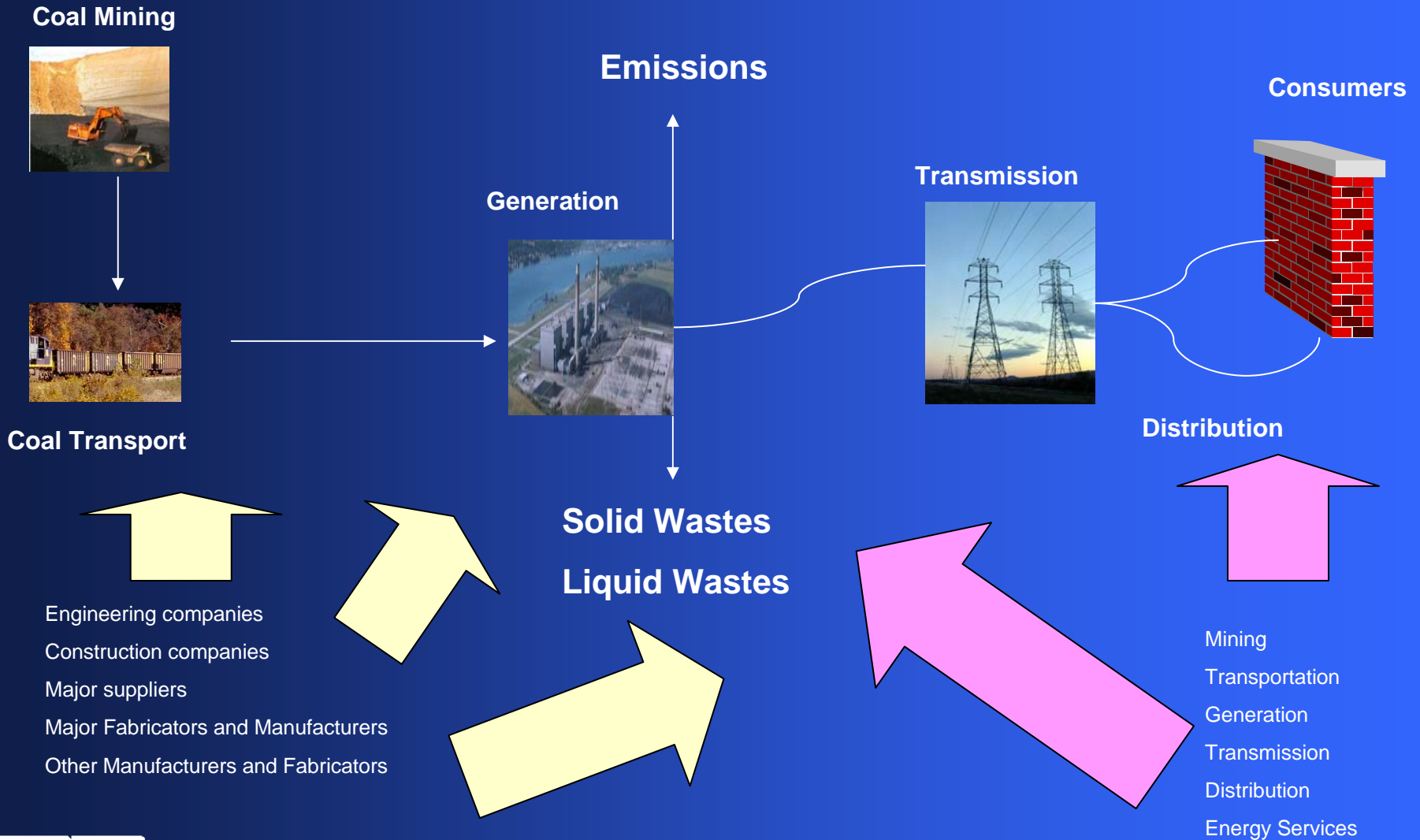
Competitive markets – Various Entities not necessarily based in the state they serve



The Boomer Retirement Issue: From the Wellhead to the Wall



The Boomer Retirement Issue: From the Mine to the Wall



The Boomer Retirement Wave

- **Power industry consolidations (with incentives to retire), competitiveness (downsizing) will increase it**
- **Cost cutting and productivity improvements and new technologies will also increase it**
- **Personnel will be leaving the power industry in significant numbers at around 2010-2011:**
 - **Trained technicians and craft labor**
 - **Engineers and designers**
 - **Constructors**
 - **Manufacturers**
 - **Operators and maintenance personnel**
 - **Managers**
 - **Executives**

The Boomer Retirement Wave

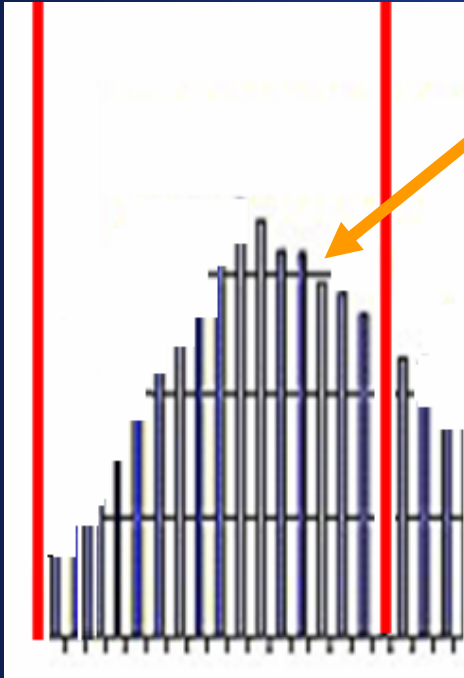
- In specific power industry market segments the boomer retirement wave is seen as a means of lowering costs
- However, there are still no major incentives for young people to consider careers in the power industry, the way we had them back in the 60s-70s

We are running out of time!

Boomer Wave into Retirement

Probable

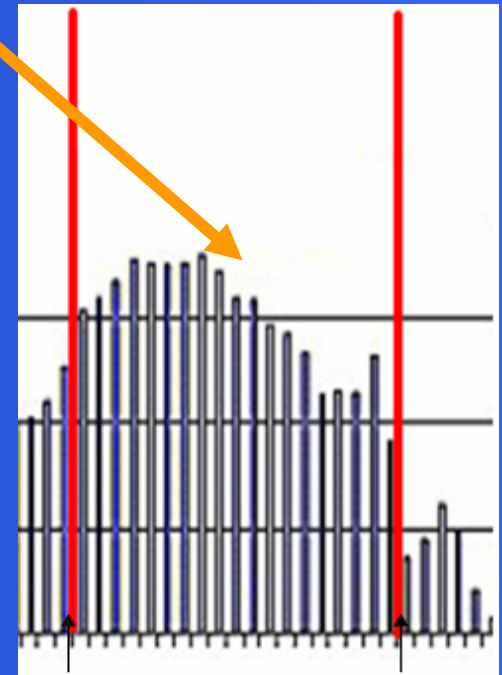
Power Industry Boomer Wave



The power industry retirement wave will probably be front loaded while the middle and back end of the power industry boomer wave into retirement is affected by factors directly connected to actions the power industry takes over the next few years

General Population

Boomer Wave



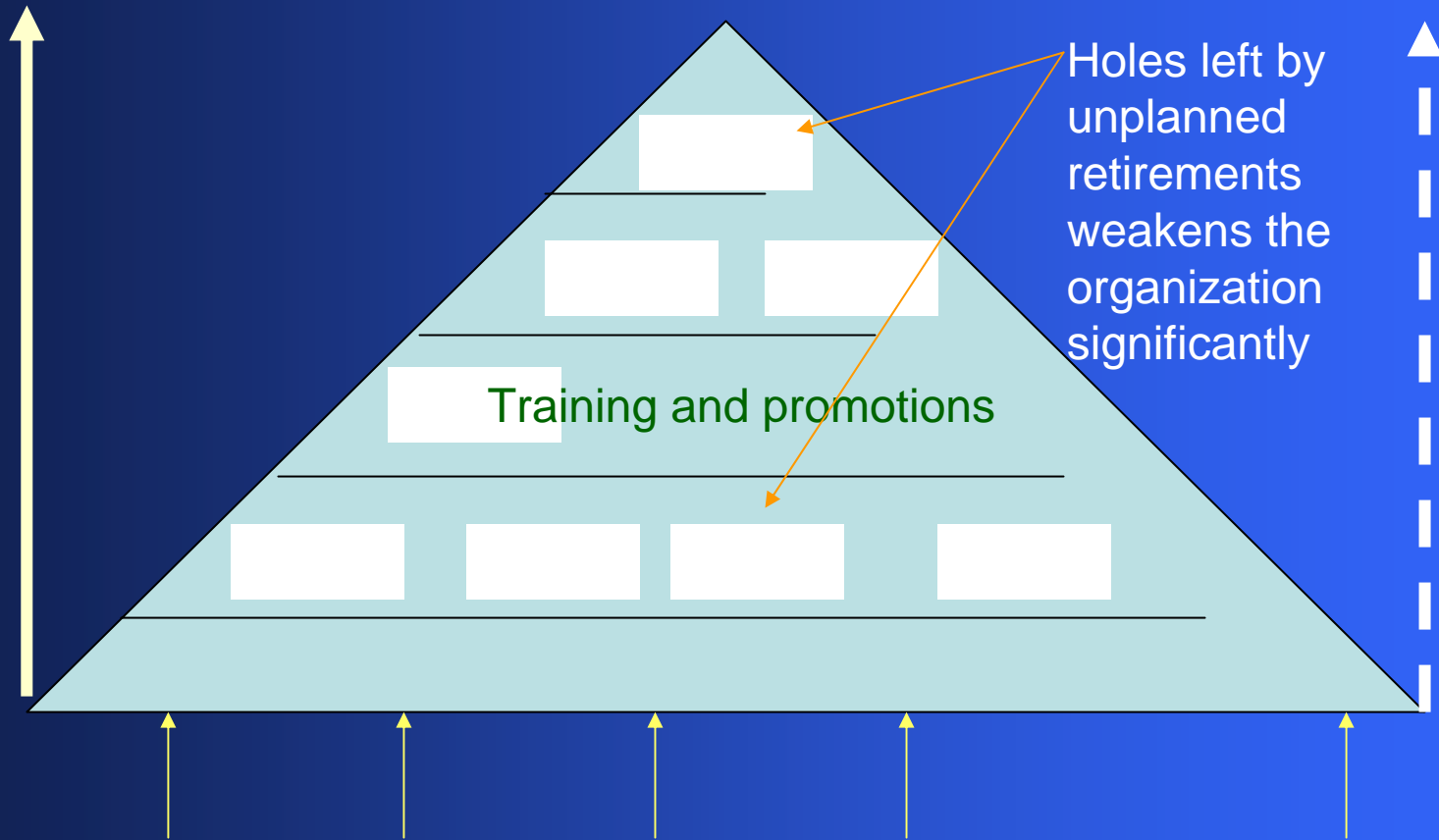
Consequences Over Time

- Major effect on the various power industry organizations (more of a services industry today)
- Knowledge and know-how leave affecting the reliability and profitability of major entities of the power industry
- Inability to resource properly
- Potential cost increases
- More jobs going overseas where there is a larger pool of engineers and lower costs-- more of this know-how goes with them permanently
- Electric power reliability and security at risk

Effect on the typical organization

Experience Level

Organizational Level



Holes left by unplanned retirements weakens the organization significantly

Training and promotions

Pool of incoming personnel

Knowledge and Know-How

- **Basic information lost in the turmoil of consolidations, sales and acquisitions**
- **Systems have changed from paper based to mainframe based to individual PCs**
- **Lack of centralized information/data collection-
Knowledge Systems**
- **Lack of flux of engineering graduates entering into our organizations**
- **The overall state of our power industry in terms of attracting people (the negative publicity it has received in the past)**

Various Approaches To The Solutions

- **Lessons from our recent past**
 - **What worked and did not work**
- **Computer technology and IT systems can be a great asset to (not available in the past)**
- **Funding via the corporate or plant business or operational plans budgets- year to year**
- **Public Perception and the Industry**
- **Government Policy**

Approaches to the Boomer Vacuum in Power Generation

- **Learn from the lessons from our recent past**
 - **1960s to mid-1980s policies:**
 - **Emphasis on science and technology during the cold war years directly supported the educational institutions**
 - **Emphasis on advanced technical degrees and funding of scholarships and fellowships**
 - **Pool of incoming “trained” personnel from the Navy, its Nuclear Program and Merchant Marine**
 - **Corporate educational and training programs widely used in the power industry supported the development of personnel**
 - **Labor union training programs**

Increasing the available pool of personnel the industry can tap

Approaches to the Boomer Vacuum in Power Generation

- **Learn from the lessons from our recent past**
 - **Promotion of participation in “technical papers and conferences” such as Power Gen**
 - **Training programs using simulation techniques**
 - **Internships at colleges and universities**
 - **Scholarships and fellowships provided by the industry**
 - **Acquaintance programs for high school seniors and juniors**
 - **Industry investing to attract and develop its personnel**

Approaches to the Boomer Vacuum in Power Generation

- Application of computer technology and IT systems can be a great asset to (not available in the past):
 - Provide **residence** to the knowledge base
 - Drawings, specifications, procedures, lessons-learned, etc.
 - Servers and information search engines
 - **Access** this knowledge easier and at any time
 - Increased use of laptops
 - **Exchange** knowledge and know-how
 - Web sites and experience sharing chat rooms
 - **Transfer** knowledge and know-how
 - Computer based training and simulations
 - Web based sharing of experience

Approaches to the Boomer Vacuum in Power Generation

- Funding via the corporate or plant business or operational plans budgets- year to year
 - Many of the actions to be implemented can be made part of “**how we do business**”
 - Apprenticeships
 - Training
 - Working with technical high schools and colleges
 - Grants to schools to promote the power industry technology application
 - Corporate **scholarships and internships** to colleges and universities promoting specific programs with ties to obtaining personnel after graduation
 - It must provide for **incentives for college graduates** to attract them to come into the industry

Increasing the pool of personnel in the US coming into our organizations

Approaches to the Boomer Vacuum in Power Generation

- **Public Perception and the Industry**
 - The industry needs **to improve from the negative perception of**
 - ENRON
 - Polluting power plants
 - Radiation issues
 - The industry needs to **point out the criticality of its functions to the well being of our nation's economy and its people**
 - The industry needs to implement **programs to educate the general population as to its needs, functions, and contribution to society**
 - It must **address these issues through the channels the average American is accustomed to** best receive messages
 - (The AGA did years ago with its effective gas flame advertising)
 - It must provide for **incentives for college graduates to** attract them to come into the industry

Approaches to the Boomer Vacuum in Power Generation

- **Government Policy**

- The Federal government should **re-establish a strong emphasis in science and technology specifically addressing power industry needs** in a manner similar to what it did in the 1960s and 1970s via
 - Research grants to colleges and universities
 - Scholarships and fellowships programs with a tie to at least 2-4 years in the industry
 - Tax incentives to private industry to invest in these areas
 - The next energy bill must address the issue of human resources in the energy industry to maintain security and reliability
- The **State Governments should also do their part**
 - Local scholarships and fellowships similar to above
 - More emphasis in science and technology in local public and private high schools particularly those involving technical trades
 - Tax incentives to private industry to invest in these areas
- **General policy statements** should be provided to the news media as to the importance of the boomer retirement issue, its consequences and what both the Federal and State governments are proactively doing to minimize impact in the economy or well being of all citizens

Specific first steps

- The extent of the problem differs from entity to entity depending on the type of organization, present staff composition and culture
- The following general steps should be considered:
 - Inventory
 - Identification
 - Survey
 - Critical Area Analysis
 - Establish a strategic plan to address the issues
 - Fund the plan

Specific first steps

- **Inventory the “boomers”**
- **Identify the most vulnerable areas of the organization and impact on plant operations**
- **Conduct survey as to their plans (check with counsel)**
- **Conduct Critical Area Analysis to determine**
 - **Effect on existing technical and business operations**
 - **Effect on LT growth and productivity**
 - **Effect on the bottom line**
- **Establish an strategic plan and fund it**
- **Feedback and update the plan**

Solutions

- **Steps**
 - **Increase the pool of personnel coming into the organization**
 - Provide summer internships to engineering college students
 - Provide training programs at technical colleges or vocational high schools
 - Provide scholarships and fellowships tie to a commitment to the organization
 - Provide sign-up incentives
 - Provide flexibility within the organization for more use of virtual operations effectively increasing the amount of work that can be done
 - Would attract more women
 - Would attract more retirees as consultants
 - **Use of computer technology as residence of the knowledge base of the company**

Solutions

- **Steps**

- **Replacement of retiring personnel**

- One to one replacement with knowledge transfer (allow for attrition)
 - Phase out and phase in – incentivize the retiree to consult
 - Outright replacement
 - Elimination of the position and replacement with technology
 - Outsource to overseas locations
 - Training for single replacement or team replacement from within the organization
 - Simulation techniques (using knowledge based systems)
 - » Project simulation
 - » Power plant operations and maintenance simulation
 - Computer based training programs

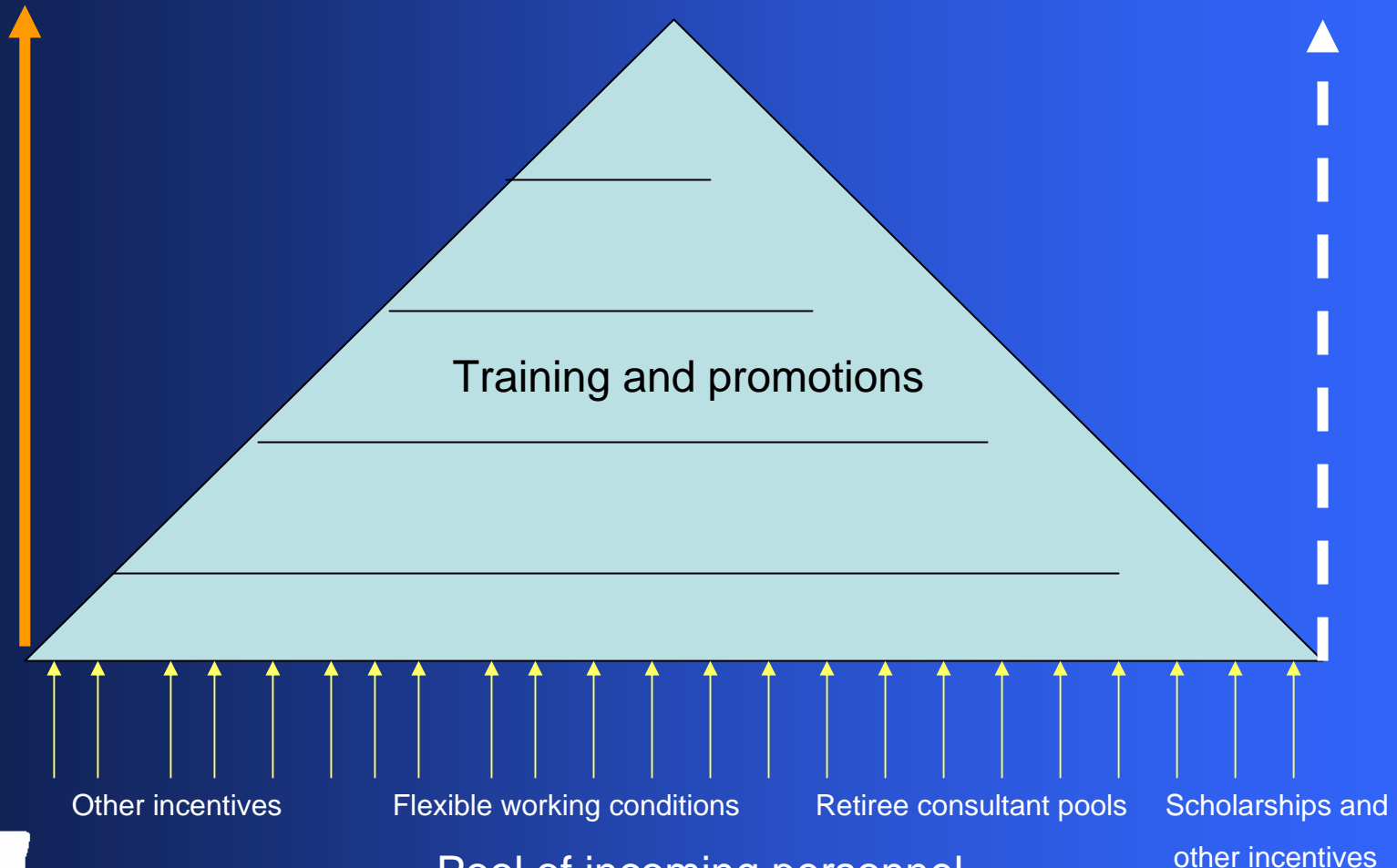
- **Training of existing and/or new personnel**

- Classroom or computer based
 - On the job training
 - Shadow teaming
 - Simulation

Typical Growth of the Individual within an organization

Experience Level

Organizational Level



Examples of Solution Practices

- **Retiree reservists pools**
- **Improving relationships with colleges and trade schools to improve obtaining and training of potential trades retirement replacements**
- **Project simulation training**
- **Some utilities are placing additional emphasis on their existing training programs and funding scholarship programs at local engineering colleges**
- **We at Burns and Roe have a program of summer internships for engineering college students and we collaborate with local high schools in their weekly high school senior thesis program. It also has re-emphasized its professional educational program**

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Burns and Roe

- Engineering, Procurement, Construction Management and Consulting
- Worldwide over 1200 professionals
- Key Features:
 - Responsiveness
 - Client Satisfaction
 - Design to the Estimate
 - “Best of the Best”
- A history of firsts
 - Fossil
 - Nuclear
 - Undersea transmission