

Challenges of the Aging Workforce And Knowledge Transfer

A Presentation to



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September 2006**

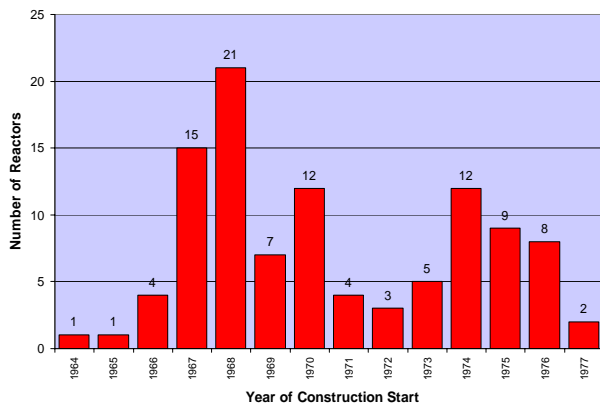
Presentation Agenda

- **Some Nuclear History**
- **The Recent Trend in Plant Staffing Levels**
- **Is The Aging Workforce a Crisis?**
- **Current Approaches/Success Stories**
- **New Staffing Demands Are Coming**

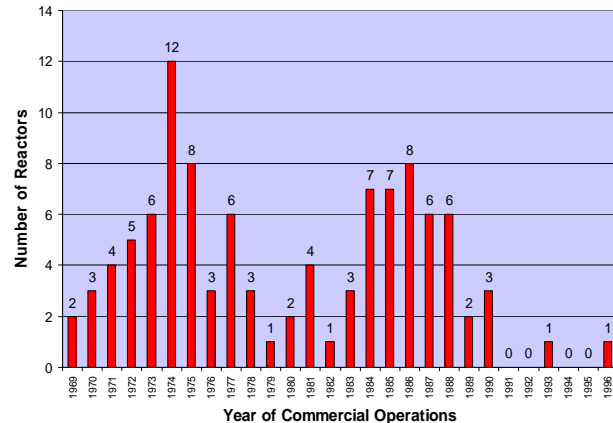


Most Nuclear Plants Were Built And Began Commercial Operations Between 1969 & 1990

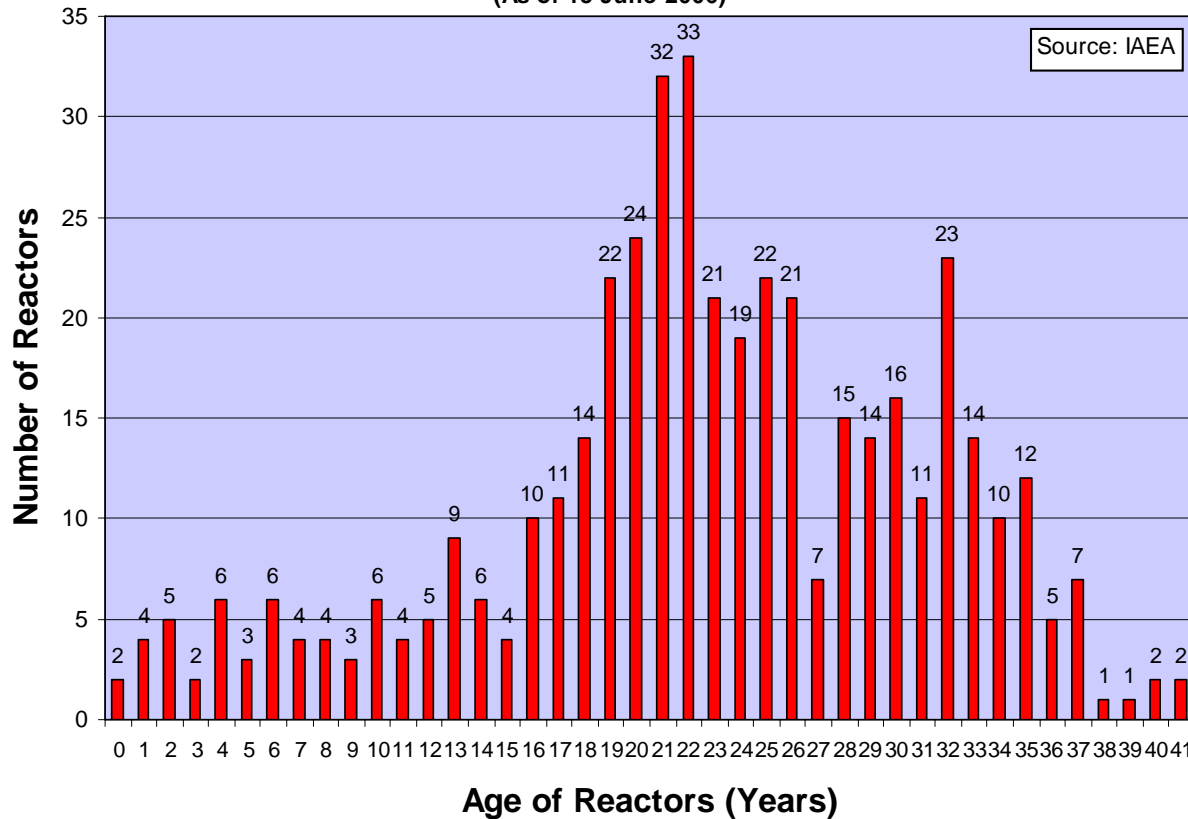
U.S. Reactor Construction



U.S. Reactor Commercial Operations



Number of Reactors By Age
(As of 15 June 2006)



Nuclear Plants Have 5 Lifecycle Elements Related To Staffing

<i>Lifecycle Element</i>	<i>Duration</i>
Construction	A Few Years
Startup/Testing	Less Than 1 Year
Commercial Operation	30-40 Years (Or More)
Safe Store	Variable
Decommissioning	A Few Years

- There is an overlap between the longest lifecycle element and the length of a typical working career
- For any workers who began with the construction phase, they will retire or leave before the end of plant life



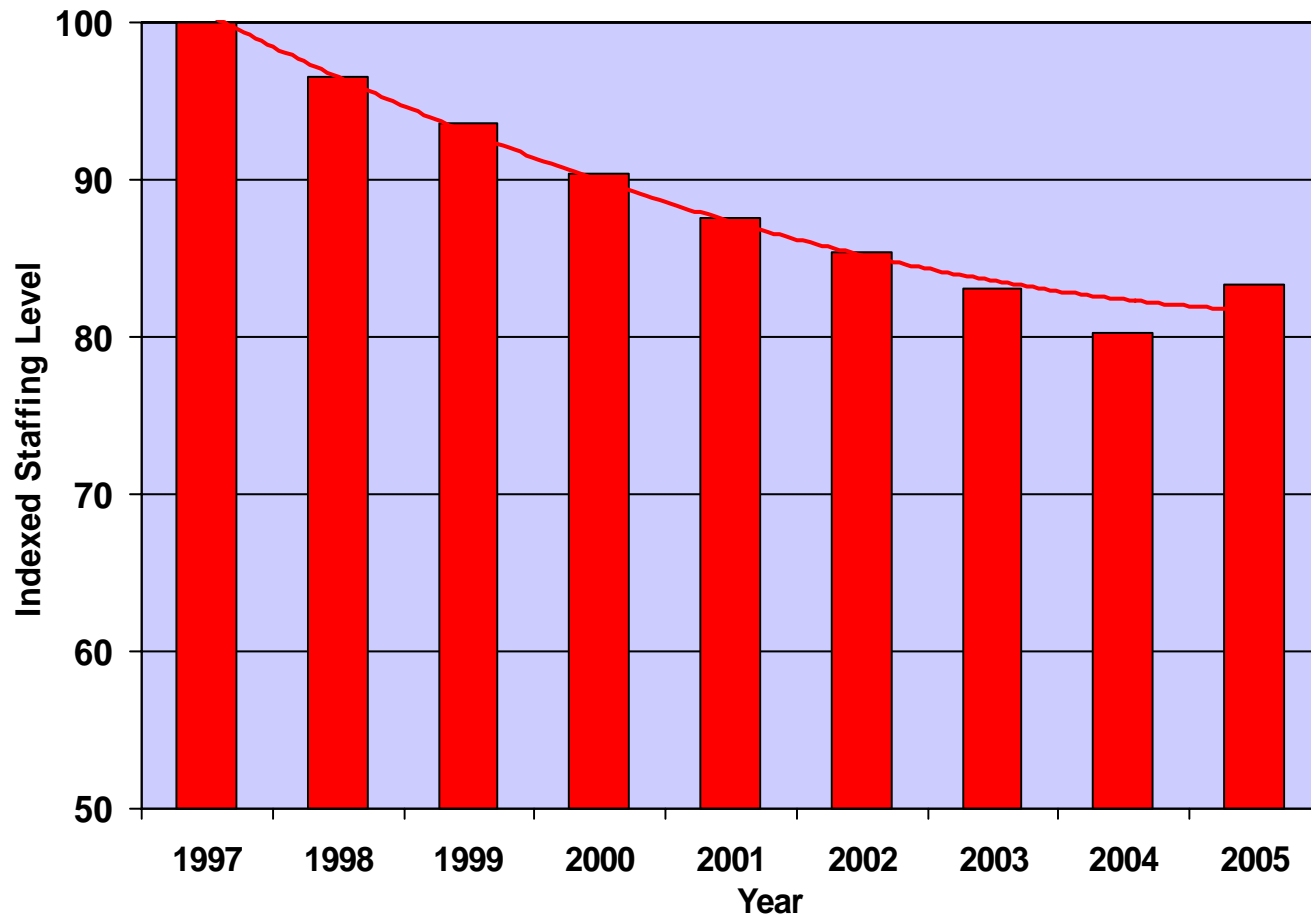
After Commercial Operations Commenced, Site Personnel Levels Declined

- **Initial personnel levels on site consisted of several groups**
 - Construction Craft
 - Architect/Engineer Staff
 - Operations Staff/Trainees
 - Technical Experts/Vendor Staff
 - Regulatory Staff
- **After commercial operations began, there were typically two major decreases in staff size**
 - Reduction in construction personnel (quickly)
 - Reduction in contractor staff augmentation (slowly)



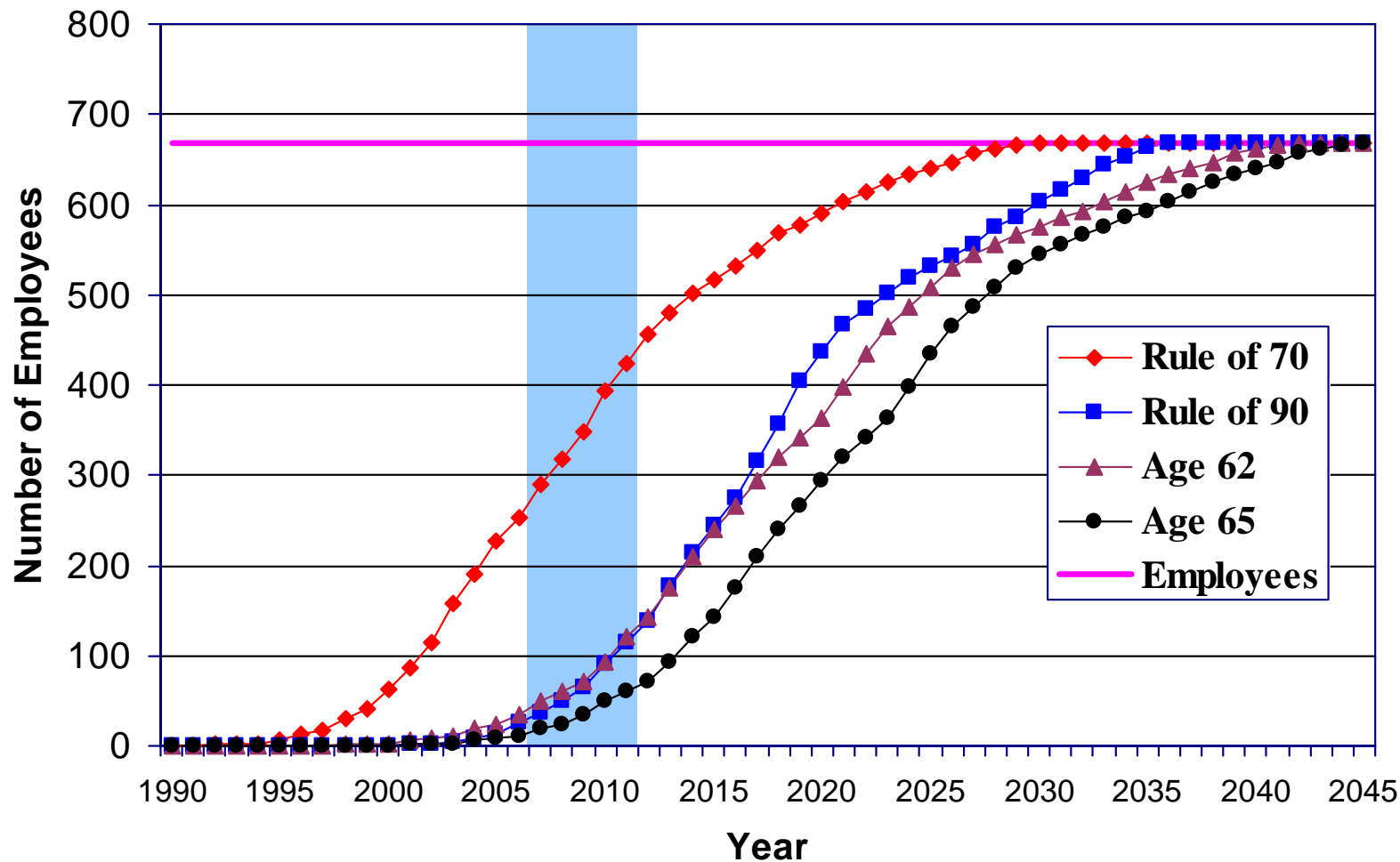
As The Workforce Aged, Staffing Levels Simultaneously Bottomed Out

U.S. Nuclear Industry Staffing Levels



Each Plant Has Its Own Age Demographics, But The Picture of Near Term Attrition Is The Same

Example U.S. NPP Age Demographics

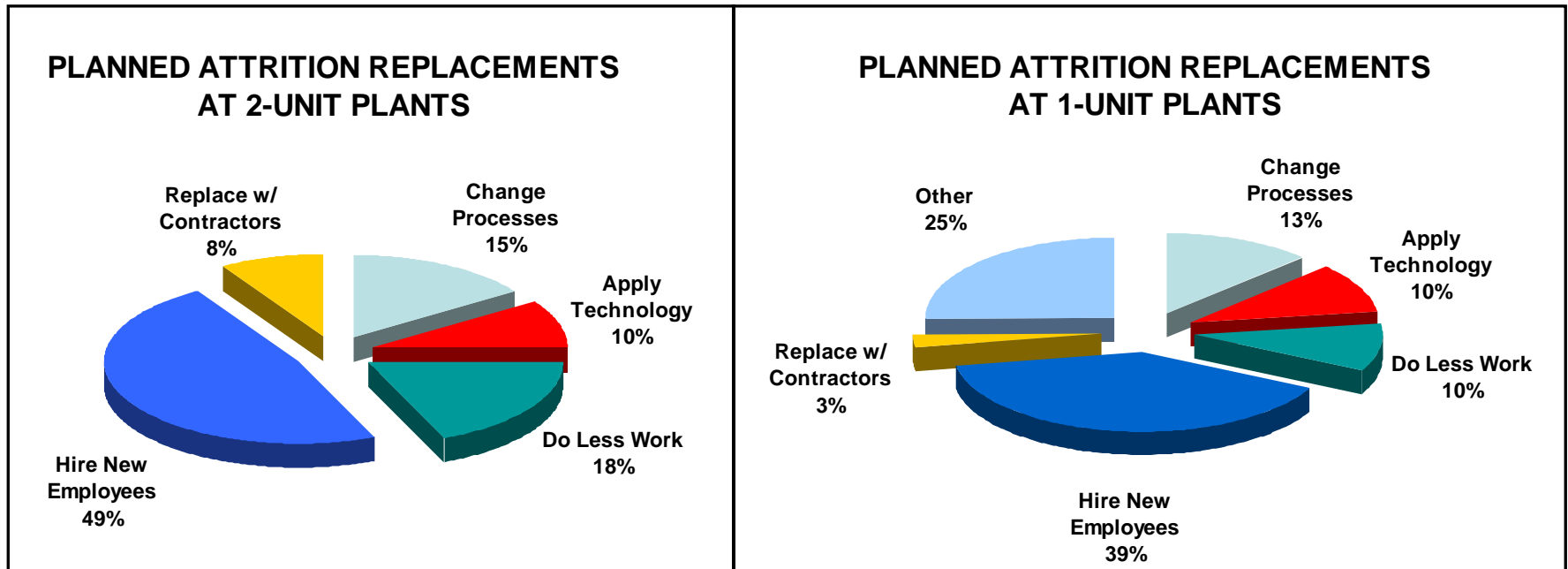


Impending Attrition May Significantly Impact Nuclear Plant Operations & Planning

- **The aging workforce in the nuclear power industry will create universal attrition problems, particularly in maintenance and engineering**
- **The maintenance and engineering areas of a nuclear plant require highly developed skills sets that require a combination of training and on the job experience**
- **There is a likely shortfall of personnel in these two areas that will develop within the next 5 years, and beyond**
- **Overcoming the potential lack of personnel will require a combination of actions; including**
 - **Identifying and planning for the potential personnel shortages**
 - **Identifying opportunities for staffing reductions where possible**
 - **Attracting, hiring, and retaining new personnel**
 - **Training these personnel, both technically and experientially**



U.S. Nuclear Plants Will Hire Replacements For 40-50% Of Retirees



- This raises two questions:
 1. Will there be a loss of knowledge with so many retirees and so few newly hired personnel?
 2. Where will the new employees come from?

Resource Sharing And The Diffusion Of Experience Has Been Increasing

- **Industry groups (ANS, NEI, INPO, IAEA, etc.) have become successful at developing forums for information and experience exchange**
- **Consolidation of individual plants into nuclear “fleets” has created reservoirs of technical knowledge and experience**
- **In the United States, two large voluntary alliances have formed and gained multiple benefits**
 - **The Strategic Teaming And Resource Sharing (STARS) Alliance**
 - **The Utilities Services Alliance (USA)**
- **One U.S. plant undergoing extensive capital upgrades created a Major Projects Division to run the projects and use this capital program time window to focus on the transfer of knowledge**



For Some U.S. Nuclear Companies, Knowledge Transfer Is Becoming Programmatic

- *Directors of Site Operations* at Progress Energy which is an organizational approach to develop potential new site vice presidents, also provides “bench strength”
- *Assistant Plant Managers* at Tennessee Valley Authority
- *Internal manager rotations* at many plants
- Senior Reactor Operator (*SRO*) *requirements* for some leadership positions
- *Operators rotate* to become training instructors and other leaders
- *Maintenance craft internally transfer* to become training instructors, work package planners, or plant work week schedulers
- *Engineers internally transfer* to become qualified plant operators



Other Knowledge Transfer Approaches Include Coordinated Educational & Training Programs

- **The South Texas Nuclear Project Nuclear Operating Company (STPNOC) and Brazosport College in Brazoria, Texas have developed a relationship that facilitates training that is targeted for current and future nuclear plant employees**
- **The First Energy Nuclear Operating Company (FENOC) and the Lakeland Community College in Kirtland, Ohio have developed the coordinated educational program:**
 - **A two year accredited Associate Degree**
 - **A ten week field experience term at the Perry nuclear plant**
 - **Student trainee positions at FENOC nuclear plants to attract young local personnel**



Work Force Planning Activities Are Growing In The U.S. Nuclear Power Industry

- **Until very recently, most nuclear plants had only a small human resources staff, who did not perform organizational development activities, workforce planning, or ascension planning**
- **A few plants and companies began to perform these planning activities within the last few years**
- **They have begun to analyze their expected personnel attrition, and therefore identify hiring and training requirements**
- **However, what is often missing in their process is a systematic approach to identifying, prioritizing, and managing knowledge transfer to the next generation of workers**



Knowledge Transfer Is Difficult, But Achievable

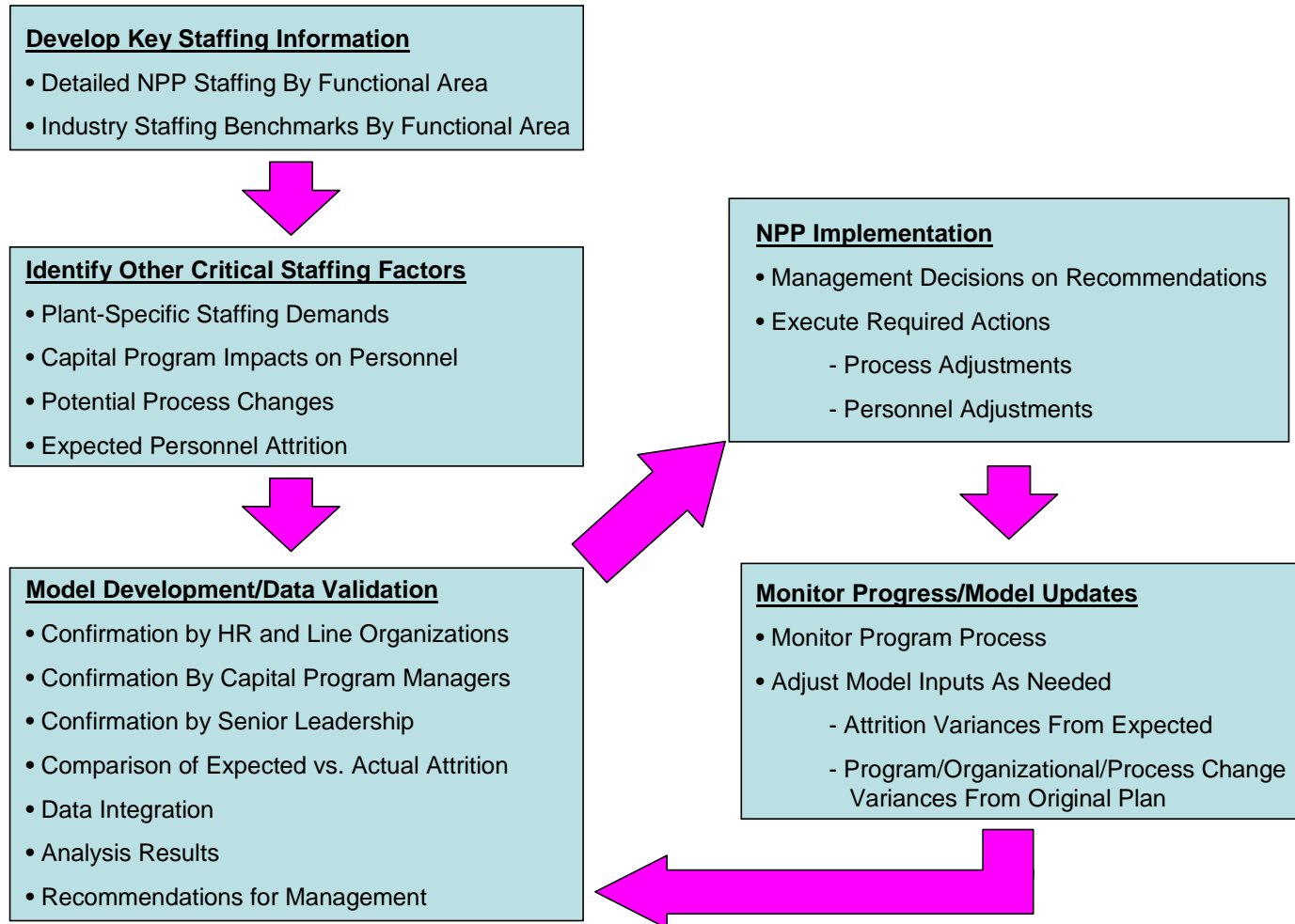
- The Tennessee Valley Authority (TVA) in the U.S. has lead the industry in developing attrition management and knowledge transfer programs
- TVA began by prioritizing potential risks due to personnel attrition and potential knowledge loss:

$$\text{Retirement Factor} \times \text{Position Risk Factor} = \text{Total Attrition Factor}$$

- Next, they developed a detailed assessment of how much of that knowledge was documented, and began programs to collect, document, and index the remaining information
- This initial approach provides a short term solution
- However, long term plans are also needed, including the timely management of company wide personnel requirements



Goodnight Consulting Has Developed An Approach To *Strategic Personnel Planning*



Key Actions Will Be Required To Overcome Personnel Attrition & Support Knowledge Transfer

- Most plants will need to *conduct workforce planning analyses* to identify and plan for their potential personnel shortages
- Nuclear plants and fleets need to *develop knowledge transfer programs*, which will need to combine three important elements
 - Identification of knowledge loss risks due to attrition
 - Prioritization of those risks
 - Action plans to mitigate those risks, including strategic planning
- Other actions will be necessary to *compete with the labor demands of the nuclear renaissance and plant life extensions*
 - “Marketing” programs to attract and retain workers in a suddenly competitive labor market
 - Increases in compensation and benefits may be required

