SCHOOL OF NUCLEAR KNOWLEDGE MANAGEMENT

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Risk Management of Knowledge Loss in Nuclear Industry Organizations

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Risk Management of Knowledge Loss in Nuclear Industry Organizations

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Risk Management of Knowledge Loss
Agenda

IAEA Technical Report - "Risk Management of Knowledge Loss in Nuclear Industry Organizations" – to be published late 2006

- **Objectives**

- **Knowledge Management Terminology**

- **Managing Work Force Issues – A Strategic Approach**

- **Knowledge Loss Risk Assessment Processes and Tool**

  - *The Three Step Process – Tennessee Valley Authority Experience*

  - *Employee Self-Assessment*

  - *Institutional Knowledge Loss*

- **Summary and Conclusions**

RISK MANAGEMENT OF KNOWLEDGE LOSS IN NUCLEAR INDUSTRY ORGANIZATIONS

IAEA
International Atomic Energy Agency
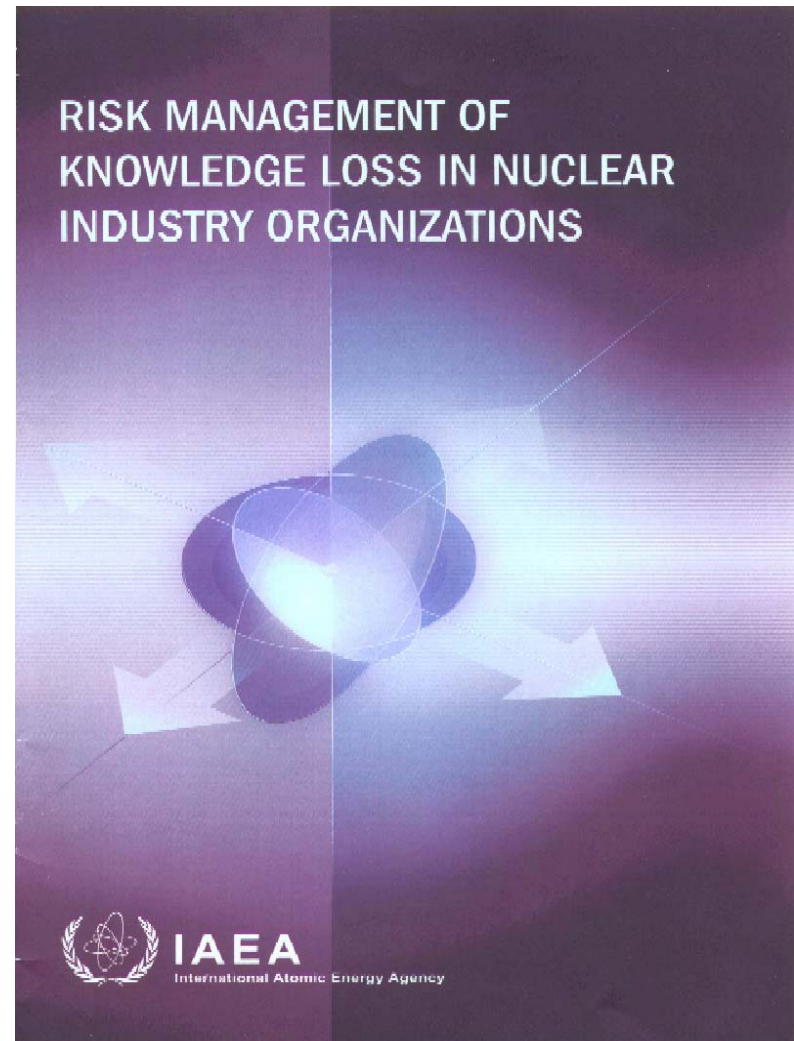
Risk Management of Knowledge Loss
Objectives

- Increase awareness among NPP senior and mid-level management of the need to develop a strategic approach and action plans to address the potential loss of nuclear knowledge and skills.

- Provide practical processes and tools for conducting risk assessments to determine the potential for loss of nuclear knowledge (*especially undocumented knowledge)* caused by the loss of experienced workers.

- Enable NPP management to utilize this knowledge to improve the skills and competences of new and existing workers.

Risk Management of Knowledge Loss
KM Terminology

- **Knowledge:** The acquiring, understanding and interpreting of information. Knowledge is often used to refer to a body of facts and principles accumulated by humankind over the course of time. *Explicit knowledge* is knowledge that can be easily expressed in documents. *Implicit knowledge* and *tacit knowledge* represent knowledge or know-how that people carry in their heads. *Explicit knowledge* is contained in documents, drawings, calculations, designs, databases, procedures and manuals. *Implicit knowledge* and *tacit knowledge* are held in a person's mind and have typically not been captured or transferred in any form (if they had, they would then become *explicit knowledge*). Compared with *explicit knowledge*, such knowledge is more difficult to articulate or write down and so it tends to be shared between people through discussion, stories and personal interactions. It includes skills, experiences, insight, intuition and judgment.

- **Knowledge Management:** The integrated, systematic approach to identifying, acquiring, transforming, developing, disseminating, using, sharing, and preserving knowledge, relevant to achieving specified objectives. Knowledge Management helps an organization to gain insight and understanding from its own experience. Specific activities in knowledge management help the organization to better acquire, store and utilize knowledge.

Risk Management of Knowledge Loss
KM Terminology

- **Attrition:** A decrease in the number of employees in an organization due to retirements, other termination, or transfers to other organizations.

- **Human Assets:** The knowledge, skills and competencies of the people in an organization.

- **Critical knowledge:** The knowledge established in the context of a particular position that is deemed imperative for incumbents of said position to possess before being allowed to perform associated duties and tasks independently.

- **Institutional knowledge:** The collective knowledge of all the employees working in an organization or institution.

Risk Management of Knowledge Loss
Managing Work Force Issues

A Strategic and integrated approach considers the interactions of programs and process that focus on managing human capital. This may include the following:

- Work Force Planning

- Recruiting Initiatives

- Training Programs

- Succession Planning and Leadership Development

- **Knowledge Management**

Note: NKM is considered to be a cross-cutting activity. Consequently, it is not intended to replace existing programs but rather to enhance their effectiveness.

Knowledge Loss Risk Assessment Processes and Tools

Note: Best practices documented in "Risk Management of Knowledge Loss in Nuclear Organizations" - IAEA Publication; STI/PUB/1248; 31pp. ISBN 92-0-105406; English; to be published late 2006

Retaining critical knowledge that could be lost to attrition

The Three Step Process

Retaining Critical Knowledge that could be lost to attrition

The Three Step Process

- **Step 1.** Conduct a *Knowledge Loss Risk Assessment*

- **Step 2.** *Determine Approach* to Capture Critical Knowledge

- **Step 3.** *Monitor* and *Evaluate*

- *This process has been successfully utilized by The Tennessee Valley Authority – The process and an example of implementation at the Sequoyah NPP will be reviewed in detail.*

Knowledge Retention Development and Focus

Knowledge Management can be a broad and complex undertaking

8 Knowledge Management Strategies

- External Best Practice Sharing

- Internal Best Practice Sharing

- Competitive Intelligence (CI)

- Knowledge of Customers

- Innovation & Creation of New Knowledge

- Intellectual Capital and CI Protection

- **Avoidance of Knowledge Loss Through Attrition**

- KM Information Technology Tools

Knowledge Retention
Development and Focus

Critical Considerations in Development of the KR Process

- Focusing on the <u>critical</u> (High Priority) positions where knowledge loss is the greatest threat

- Identifying and prioritizing the <u>specific</u> knowledge and skills at risk

- Developing concrete, <u>actionable</u> responses to mitigate this loss.

Knowledge Retention
Three Step Process

Knowledge Retention Process - Retaining Critical Knowledge

Three main sub processes/activities:

- **Step 1.** Conduct a *Knowledge Loss Risk Assessment*

- **Step 2.** *Determine Approach* to Capture Critical Knowledge

- **Step 3.** *Monitor* and *Evaluate*

Knowledge Retention
Three Step Process

"Knowledge Loss Risk Assessment"

- The "Knowledge Loss Risk Assessment" is designed to identify positions/people where the potential knowledge loss is greatest and most imminent.

- Includes Ratings based on two factors:

    - Time until Retirement

    - Position Criticality

- Provides focus - Identifies "experts" where steps to mitigate knowledge loss may be needed.

Knowledge Retention
Three Step Process

"Knowledge Loss Risk Assessment"

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

Retirement Factor -- The projected retirement dates in the work force planning system (whether based upon employee estimates or calculated based on age and tenure data) will be assigned a retirement factor as follows:

5 - Projected retirement date within current or next fiscal year

4 - Projected retirement date within 3rd fiscal year

3 - Projected retirement date within 4th fiscal year

2 - Projected retirement date within 5th fiscal year

1 - Projected retirement date within or greater than 6th fiscal year

Knowledge Retention
Three Step Process

"Knowledge Loss Risk Assessment"

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

Position Risk Factor -- **An estimate of the difficulty or level of effort required to replace the position incumbent. Managers/supervisors are responsible for making these ratings based upon the following criteria:**

5 - **Critical and unique knowledge and skills. Mission-critical knowledge/skills with the potential for significant reliability or safety impacts. TVA- or site-specific knowledge. Knowledge undocumented. Requires 3-5 years of training and experience. No ready replacements available.**

4 - **Critical knowledge and skills. Mission-critical knowledge/skills. Some limited duplication exists at other plans/sites and/or some documentation exists. Requires 2-4 years of focused training and experience.**

3 - **Important, systematized knowledge and skills. Documentation exists and/or other personnel on-site possess the knowledge/skills. Recruits generally available and can be trained in 1 to 2 years.**

2 - **Proceduralized or non-mission critical knowledge and skills. Clear, up-to-date procedures exist. Training programs are current and effective and can be completed in less than one year.**

1 - **Common knowledge and skills. External hires possessing the knowledge/skill are readily available and require little additional training.**

Knowledge Retention
Three Step Process

"Knowledge Loss Risk Assessment"

Retirement Factor $\times$ Position Risk Factor $=$ Total Attrition Factor

Total Attrition Factor -- An estimate of the effort and urgency necessary to effectively manage the attrition.

20-25 **High Priority** - Immediate action needed. Specific replacement action plans with due dates will be developed to include: method of replacement, knowledge management assessment, specific training required, on-the-job training/shadowing with incumbent.

16-19 Priority - Staffing plans should be established to address method and timing of replacement, recruitment efforts, training, shadowing with current incumbent.

10-15 High Importance- Look ahead on how the position will be filled/ work be accomplished. College recruiting, training programs, process improvements, reinvestment

1-9 Important - Recognize the functions of the position and determine the replacement need.

Knowledge Retention
Three Step Process

Step 1 **Step 2** **Step 3**

"Determine Approach to Capture Critical Knowledge"

- Conduct Interview to ID potential knowledge loss areas

- Assess consequences of loss using interview results and organization specific critical skills inventories

- Prioritize and ID options to retain or mitigate

- Develop and implement action plans

Knowledge Retention
Three Step Process

Step 1 | **Step 2** | Step 3

Conduct Interview to ID potential Knowledge Loss Areas

Interview Questionnaire

- General questions

- Task questions (how….)

- Fact or information questions (what…who…)

- Pattern recognition / lessons-learned questions

C. Questions About Facts or Information

A. General Questions

1. What kinds of knowledge or skills do you now have that TVA will miss most when you leave?

Questionnaire

Identifying At-Risk Knowledge

Instructions

The purpose of this questionnaire is to help you identify your critical skills and knowledge, especially those unique knowledge items and skills that might be lost when you leave TVA.

Some things to think about as you work through these questions:

- Knowledge or skill can mean several different things. We want to use a very broad definition that could include anything that new employees would need to know to do a job like yours (except for the exclusions noted below).

- Do not include standard skills that are common to your particular job or that are assumed for a particular certification or degree (e.g., journeymen electricians are expected to be able to read a blueprint, etc.). If you're not sure it is common, include it here.

- Some of the questions will appear to ask the same thing several different ways. We do this on purpose to make sure we do not miss valuable information. When the answer is something you have already discussed, simply say so rather than repeat the information again.

- When we ask you to describe or list things, give us a general description and not a detailed description. Don't try to tell us how to do something. We will come back and gather this level of detail later. For now we are just trying to build lists to evaluate and prioritize.

- For each major piece of knowledge, try to give us some sense of how important it is and how much trouble we may be in due to attrition. Tell us if the knowledge is written down somewhere or not, who knows it besides you, what would likely happen if no one knew this, how long it takes someone to learn it, etc.

- The questions under section B will produce lists. In many cases these lists will already exist in job descriptions, training programs, PM procedures, and/or in various databases. If so, simply refer to the appropriate source or list and tell us how to find it. In other words, there is no need to try to rewrite the list in the interview.

18

Knowledge Retention
Three Step Process

Assess the Consequences and Develop Plan

Step 1 | **Step 2** | **Step 3**

- **What is the relative <u>importance</u> of this knowledge item?**

- **What is the <u>rarity</u> of the knowledge item?**

- **What is the difficulty (cost and feasibility) of <u>recovery</u> for this knowledge loss item?**

- **Develop & Implement Knowledge Retention Plan**

ANALYSIS FORM FOR ASSESSING KNOWLEDGE/SKILL CRITICALITY

Position: Incumbent:

General position description:

Factors to Consider	Importance	Rarity of Knowledge	Recovery Difficulty
	• Impact on safe, reliable, and efficient operations • Localized vs. system-wide impact • Existence of alternative methods	• Redundancy of knowledge locally and TVA-wide • TVA-specific knowledge • Existence & cost of outside resources • New hires with this knowledge available • Loss gradual or abrupt	• Documentation or records exist • Lead time needed to document or transfer
Rating scale	1 = Low	3 = Moderate	5 = High

-risk skill or knowledge	Importance	Rarity of Knowledge	Recovery Difficulty	CRITICALITY SCORE
	X	X	=	
	X	X	=	
	X	X	=	
	X	X	=	
	X	X	=	
	X	X	=	
	X	X	=	
	X	X	=	
	X	X	=	
	X	X	=	
	X	X	=	
	X	X	=	

Knowledge/Skill Criticality Worksheet, rev. 2   May 2001

Knowledge Retention
Three Step Process

ID Options to Retain or Mitigate Knowledge Loss   Step 1 | Step 2 | Step 3

Codification

- Documentation & Procedures
- Checklists, Inventories, etc.
- Performance Support Systems
- Concept Mapping

Alternative Resources

- Agency/site/department expert
- Rotational or "Visiting" Staff
- Multi-skilling or Cross-training
- Contractors, part-timers, retirees

Engineer It Out

- Process Improvement
- Update Equipment
- "Smart" tools and technology
- Eliminate task, product or service

Education & Training

- Classroom and Simulator Training
- CBT, Video-based, and alternative delivery
- OJT and Targeted Work Assignments
- Coaching, Shadowing and Mentoring
- Apprenticeship Programs

Knowledge Retention
Three Step Process

Step 1 **Step 2** **Step 3**

Monitor and Evaluate Knowledge Retention Plans

- ✓ Review updated Work Force Planning Attrition Data - *Annually during Business Planning*

  - ➢ Review previous Knowledge Retention Plans

  - ➢ Identify areas that need to be reassessed (*Repeat Knowledge Loss Risk Assessment* - Step 1)

- ✓ Monthly Work Force Reviews (Held at each site and in the Corp. office)

- ✓ Bi-Annual Succession Planning Reviews (Strategic Talent Management Process)

Employee Self-Assessment

Risk Management of Knowledge Loss
Employee Self-Assessment

What are we after?

- Tacit Job Knowledge:
  - Familiarity, awareness, or understanding gained through experience or study
  - What has been discovered, or learned
  - Specific information about something
- Preventing errors due to knowledge loss:
  - Avoid situation where tasks/jobs are missed due to loss of knowledge

Risk Management of Knowledge Loss
Employee Self-Assessment

Who has this knowledge?

- The worker who is leaving
  - Knows their job and what it takes to do their job
- The worker's supervisor
  - He/she may have done the job before but at least should be familiar with the work the current employee is doing
- Other workers
  - Those who may have assisted the employee to perform the job

Risk Management of Knowledge Loss
Employee Self-Assessment

Where can the self-assessment process be of value?

- – To capture information from employees who terminate

- – To capture information from employees who are nearing retirement

- – To assess critical jobs for incumbents that perform specialized or critical work

Risk Management of Knowledge Loss
Employee Self-Assessment

What does the process involve?

- Standard form for all terminations

- Self Assessment: Employee is requested to Identify all tasks performed to support job functions

  - Day-to-day tasks

  - Team meetings

  - Industry / Peer groups

  - Emergency Response Organization duties

  - Outage role (Our site / other sites)

  - Current benchmarking efforts (etc)

Annex V

EMPLOYEE SELF-ASSESMENT
KNOWLEDGE RETENTION PROCESS

This process was developed to capture critical information on the job and tasks performed by (organization name) employees who are terminating or transferring to other organizations. These forms facilitate the gathering of additional information pertinent to the individual's skills, knowledge, and duties in order to maintain critical knowledge to the safe and efficient operation of (organization name).

The assessment of an employee's critical knowledge consists of 2 steps, the *Employee Self Assessment* and the *Employee Task Assessment*. The *Employee Self Assessment* is geared to provide general information from the employee of their current job tasks as well as information regarding meetings they attend, emergency position they hold, etc. The *Employee Task Assessment* provides more specific information about 1–5 **major** tasks that the employee participates in. These major tasks may include activities they perform as part of their every day job or may be collateral duties such as outage assignments.

Critical knowledge can either be apparent, where the individual is recognized as 'the' expert in a task or area, or it may be 'deep-seated', where critical steps are so ingrained in the individual that they may or may not recognize it as critical. This method of knowledge retention is a self-elicitation method that may need to be followed up with more detailed review of the employee's information.

Once an employee has given his/her notice of termination or transfer, their manager should give them both the *Employee Self Assessment* form and the *Employee Task Assessment* form to complete. The employee should complete the forms and return them to their manager as quickly as possible so they can be reviewed. The employee should copy and complete the *Employee Task Assessment* form for **each** major task they perform. Typically no more than 5 tasks should be critical enough to be documented. In the event the employee is unable to complete these forms (due to Death / Disability or termination for cause), the supervisor will complete as much information as he/she is able to.

Once the employee has completed both the *Employee Self Assessment* and the *Employee Task Assessment*, Department Managers and Supervisors should review the tasks performed by the individual and make a decision as to whether additional assessment is needed.

Once all assessments are complete, the completed assessments should be forwarded to the department manager.

When asking employees to complete the self-assessment, stress to them the value they bring to the organization and how important it is to (organization name) future to make sure that their transition goes as smoothly as possible and critical tasks are captured and risk analyzed.

Risk Management of Knowledge Loss
Employee Self-Assessment

What does the process involve?

- **Self Assessment (continued)**
  - Ask for Skills / Knowledge
  - Open Actions or ongoing commitments
  - Functional leads or contracts managed
  - Level of Approval Authority
  - Certifications / Licenses
  - Departmental Interfaces
  - Names of others who can/do perform each task

TABLE V–1. EMPLOYEE SELF-ASSESSMENT FORM

| Name: | | Title: | |
| Department: | | Supervisor: | |

Please return this completed assessment to your supervisor / manager

1) List below all meetings that you attend and the function that you fill at that meeting. Indicate the frequency of these meetings and an approximate time that each meeting takes. Indicate whether you have preparatory work to do prior to the meetings, and if so, give details and time involved.

Meeting Name	Frequency	Duration	Role

2) List below any memberships you have for Industry groups, associations or Peer Groups

Group	Role	Frequency of meeting

3) List below any emergency response positions:

4) List below your outage role(s):

5) Do you support outages at other sites (Shared Resources) ☐ Yes   ☐ No
If yes, what site(s)?
What function at that site(s)?

6) List below commitments you have to participate on a benchmarking trip or an assessment:

Event	Location	Date

Risk Management of Knowledge Loss
Employee Self-Assessment

Who has responsibility for actions to address knowledge loss?

- The supervisor or assigned team:
  - reviews employee self-assessment form to identify and itemize critical knowledge unique to the individual.
  - develops recommendation to recover loss knowledge/skill.
  - reassigns tasks, approval authority, and other responsibilities as necessary.
  - determines what other actions may be necessary (reorganization, work elimination, process improvements etc.).

Institutional Knowledge Loss

Risk Management of Knowledge Loss
Institutional Knowledge Loss

- We often think about KM only in terms of what individuals know. However, it is also critical for organizational knowledge to be captured in a reliable fashion - to "be there" when people need it in the future.

- The collective knowledge of the individual workers represents a tremendous investment and asset for the enterprise.

- Examples of this collective knowledge include; design changes, LERs, audit reports, budgets, expenditure patterns, vendors and equipment suppliers, procedures, training materials, blueprints, simulator codes, fuel configuration histories, etc. (Both tacit and explicit knowledge).

- This section of the report considers the impact of knowledge loss on the enterprise and the resulting impact on organizational competency (in other words, the ability to function safely and efficiently).

Risk Management of Knowledge Loss
Institutional Knowledge Loss

As with individual "expert knowledge loss threats, organizations should assess the risk of institutional knowledge loss considering both internal (e.g., loss of experienced workers) and external (business and political) factors. The following outline identifies others factors that may be considered:

- *Current Work Load:* An assessment of the current workload in the organization or department considering – work backlogs, amount of overtime, non-core functions performed.

- *Future Work Load:* Evaluate future staffing needs based on an assessment of future workload - expanding capacity, decommissioning, major modifications, plans for new build, restart, etc.).

- *Areas where critical knowledge and skills are at risk:* These areas may be general areas (e.g., System Engineering, operations, maintenance, etc) or specific to individual experts (Turbine Specialist).

- *Risk and Impact*: Based on workload assessments what risk exists and what will the impact be on the organization's performance. Consider what work can go forward and what will be deferred. Where possible, quantify the impact on safety, performance, and cost.

- *Current programs or proposed initiatives that support knowledge management:* Recognize existing programs and processes and their contribution to the retention and enhancement of institutional knowledge - identify gaps where programs or processes need to be improved.

Based on the assessment results, develop a strategic management plan to address the risk of institutional knowledge loss.

Application of KR at
Sequoyah Nuclear Plant
using the three step process

Sequoyah Nuclear Plant
Quick Facts

- 2-Units / 2320MW

- 4-loop, Westinghouse - PWR

- Ice Condenser Containment

- Commercial Operation, 1981 (Unit 1)

- 851 Permanent Site Employees

- Plus Security Contractors

Operating History

- **Groundbreaking in 1969.**

- **Major construction began in 1970.**

- **Unit 1 began commercial operation on July 1, 1981.**

- **Unit 2 began commercial operation on June 1, 1982.**

- **The longest continuous operating run for Unit 1 is 478 days, 16 hours, and 5 minutes, from November 23, 2001, to March 17, 2003.**

- **The longest continuous operating run for Unit 2 is 512 days and 16 hours, from November 18, 2000, to April 14, 2002.**

Sequoyah KR Demographics

Status/Results of Knowledge Risk Assessments:

- All employees have been assessed and have a "Score" (851 current employees).

- 10 "High Priority" KR Action Plans initially developed

- 4 "High Priority" KR Action Plans currently being monitored

Breakdown of Assessments:

- 4 "High Priority"

- 12 "Priority"

- 136 "High Important"

- 699 "Important"

Sequoyah Nuclear Plant: KR Update
Background/History

November, 2003 - First KR assessment

- Initially identified 10 "High Priority" candidates
- Internal consultant conducted interviews with all 10 candidates –Develop Action Plans
- Of 10 initially identified as "High Priority" 4 are still considered as "High Priority"
- Disposition of the other 6:
  - Employee 1, Civil Engineer: Moved retirement date 2 years out, which moved score to a less priority
  - Employee 2, Rad. Chemist: Moved retirement date 4 years out, which moved score to a less priority
  - Employee 3, Ops Specialist: Moved retirement date 4 years out, which moved score to a less priority

  - Employee 4, Maintenance Specialist: Retired after knowledge loss was captured through Action Plan
  - Employee 5, Electrical Design Engineer: Retired after knowledge loss was captured through Action Plan

  - Employee 6, Mech Maintenance Engineer: Moved retirement date, which moved score to a less priority

Sequoyah Nuclear Plant: KR Update
Current State

KR Assessments updated in March 2005

- Four "High Priority" candidates identified:

  - Employee A, Periodic Test Program Specialist: Replacement person hired from outside with turnover in progress
  - Employee B, System Engineer (Mechanical – Piping Analysis): Knowledge captured through this process and turnover to in-house personnel
  - Employee C, System Engineer (Primary water side): Knowledge captured through this process and turnover to in-house personnel
  - Employee D, Electrical Design Engineer: Knowledge captured through this process and turnover to in-house personnel

Sequoyah Nuclear Plant: KR Update
Current State

Summer 2005 Attrition Projection update for TVA Work Force Plans

- Sequoyah updated attrition information on all employees, and identified 5 additional names as potential "High Priority" status.
- After evaluations and review by the team, determined they were not in the "High Priority" category - Action Plans not needed.

- Immediate Next Steps
  - Develop KR Action Plans for the five employees on site with a position risk factor of 5 (Critical)
  - Continually evaluate the effectiveness of the program

KR Plan Example
Mechanical Engineer

KNOWLEDGE RETENTION PLAN

Employee:	Position: Engr. Mech. General (NUC)	Position Risk Factor: 4 Retirement Factor: 5	Total Attrition Factor: 20

Summary and Situation Assessment:

The incumbent has in depth knowledge of and expertise in piping analysis with emphasis on use of the T Pipe software. This software is unique to SQN and little duplication of knowledge exists. Though a replacement person with an engineering degree could become proficient in the use of this software in about six months, at least two years on-the-job training is needed to respond quickly to urgent questions related to piping analysis. In addition to the T Pipe system, there must be extensive knowledge of the Class II computer system, SDP – NEDP9, and SQN LDC 13.1 and 24.2. Though a person with a two year degree may be knowledgeable, it is preferable to have someone with a four year degree in either Civil or Mechanical Engineering.

Currently Employee A is being cross-trained on the T Pipe system. Employee B also works with this system and has significant knowledge. Employee C and Employee D work in the Chattanooga TVAN Corporate office and also have knowledge of the system.

Because the T Pipe system is unique to SQN there is no external training on its use. However ASME does provide training on piping analysis and code requirements.

Knowledge or Skill	Criticality (1-5)	Actions *(Required of Criticality 4-5)* List steps which can and will be taken to retain this critical knowledge/skill and/or minimize the impact of its loss)	Target Date(s) for Completion	Status and Issues
Rigorous and alternate piping analysis, component qualification of code components and pipe rupture analysis skills	5	• Identify a replacement person for the critical skills • Replacement person complete ASME courses in piping analysis and code requirements • Replacement person develop a working knowledge of T-Pipe Code, ASME Code, procedures and criteria through reading and mentoring of _____ and _____.	Dec 2004 Sept 2005 Sept 2005	Employee A and Employee B are being crossed trained in T-Pipe. Will send both to ASME Course when offered by TVA Training. Both being Mentored
Development Plans	5	• Supervisor assign replacement person "trail tasks" under the direction of _____ and/or ____ • Replacement complete qualification card under mentor sponsorship • Include mentoring in _____ and ___ PR&D and developmental goals in replacement individual • Recruit/hire person to replace replacement person	March 2005 Dec 2005 Sept 2004 Oct 2005	On going replacements are
Documentation	5	Incumbent to develop a piping analysis, component qualification and pipe rupture reference library of handbooks, procedures, criteria and process in conjunction with replacement person.	Sept 2004	On going will be completed by Sept.

Knowledge Retention Plan Prepared by: _OE Consultant_____   Date: November 6, 2003
Last Update: _7/22/04; Manager__

KR Plan Example
Mechanical Engineer

Summary and Situation Assessment:

- Mechanical Engineer: KLRA Results (ARF = 5, PRF = 4, TRF = 20 High Priority)

- Incumbent has in depth knowledge of and expertise in piping analysis with emphasis on use of the T Pipe software.

- This software is unique to SQN - little duplication of knowledge exists.

- Replacement person with an engineering degree could become proficient in the use of T Pipe software in about six months, at least two years on-the-job training needed to respond quickly to urgent questions related to piping analysis.

- In addition to the T Pipe system, there must be extensive knowledge of the Class II computer system and site specific procedures (SDP – NEDP9, and SQN LDC 13.1 and 24.2).

KR Plan Example
Mechanical Engineer

Summary and Situation Assessment cont:

- A person with a two year degree may become knowledgeable, however, it is preferable to have a four year degree in either Civil or Mechanical Engineering.

- Currently Employee A is being cross-trained on the T Pipe system. Employee B has T Pipe knowledge but moved to corporate engineering in January of 2005. Employee C was hired in Sept 04 – and is also being trained in the T Pipe system. Employee B has continued to mentor both new engineers as part of her new corporate assignment

- Additionally, two corporate employees also have knowledge of the system.

KR Plan Example
Mechanical Engineer

- Knowledge and/or Critical Skills
  - rigorous and alternate piping analysis (Criticality = 5)
  - component qualification of code components (Criticality = 5)
  - pipe rupture analysis (Criticality = 5)

- Actions Planned (Required for criticality 4 or 5)
  - Identify a replacement person for the critical skills
  - Replacement person complete ASME courses in piping analysis and code requirements
  - Replacement person develop a working knowledge of T-Pipe Code, ASME Code, procedures and criteria through reading and mentoring of incumbent and Employee B.

KR Plan Example
Mechanical Engineer

- Actions Planned - Continued
  - Supervisor assign replacement person "trail tasks" under the direction of incumbent and Employee B
  - Replacement complete qualification card under mentor sponsorship
  - Include mentoring in incumbent and Employee B's performance goals
  - Include developmental goals in replacement individual performance goals
  - Recruit/hire person to replace replacement person
  - Incumbent to develop piping analysis, component qualification and pipe rupture reference library of handbooks, procedures, criteria, etc.
  - Replacement to assist in development and maintenance

- Note – Actions for this KR plan were completed in early 2006

Monitoring Work Force Metrics and KR Status

Work Force Metrics provides senior management data to manage the aging work force challenge

- Headcount vs. Business Plan

- Attrition and Replacements

- Problem areas and actions planned

- Knowledge retention status (High Priority and Position Criticality)

Fiscal Year 2005
TVAN
Indicator: TVA Employees - Sequoyah
June 2005

Headcount	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	06 A	07 A
Actual Permanent Emps	873	871	866	859	856	856	857	859	873					
Actual Temp/Tenure Emps	0	0	0	0	0	0	0	0	0					
Total TVA Emps	873	871	866	859	856	856	857	859	873					
Approved Forecast	876	876	876	876	876	876	876	876	876	876	876	876	876	829
Variance to Approved FC	3	5	10	17	20	20	19	17	3					

Numbers left of the bold line are actual. Numbers right of the bold line are projected.

Attrition/Replacement	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Retirements	1	3	6	9	2	4	3	3	4	4	3	3	45
Other Attrition	0	0	2	1	0	0	1	1	0	0	0	0	5
Transfers to Other Orgs	0	1	1	1	3	1	1	2	1	0	1	0	12
Total Attrition	1	4	9	11	5	5	5	6	5	4	4	3	62
New Hires/Rehires	3	1	3	4	2	5	7	5	18	0	3	11	62
Transfers from Other Orgs	4	1	1	1	0	0	1	3	1	0	0	0	12
Total Replacements	7	2	4	5	2	5	8	8	19	0	3	11	74
Revised Forecast	n/a	870	865	860	857	857	859	858	872	869	868	876	
Variance to Approved FC	n/a	6	11	16	19	19	17	18	4	7	8	0	
FYTD Replacement %	700%	180%	93%	72%	45%	71%	83%	89%	118%	109%	107%	119%	

DEFINITION:
Total TVA employees includes part time employees.
Attrition and replacement counts are for permanent employees only.
Replacement % is the total permanent replacement YTD divided by the total attrition of permanent employees YTD.

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PROBLEM AREA
* AFI - Succession Planning

IMPROVEMENT ACTION PLANS	DUE DATE
Conduct attrition survey	Complete
Review Knowledge Retention updates	Complete
Succession Planning	
18 Positions identified	Complete
24 Candidates identified	Complete
Complete Talent Assessment	Complete
Develop & Update IDPs	Sep-05
Next Succession Planning Meeting	09/22/05

External Additions/Projections
Accepted/Not reported (2)
Approval/Offer Pending (1)
In-process (11)

On-going Classes

Mech Tech (13)	Jul-06
Elect Tech (12)	Jul-06
I&C Tech (9)	Jul-07
SGPO (16)	Sep-06

Knowledge Retention High Priority (20-25)	3
Knowledge Retention Position Risk (5)	4

Diversity Hires	27%

BASIS
TVAN FY 2005 Performance Plan Staffing Plan

Chart legend: FY Actual | FY Target | Total TVA Emps | Approved Forecast | Revised Forecast

882 852 867 GOOD 876 876 876 829

Risk Management of Knowledge Loss
Summary and Conclusions

- The KM tools and processes presented here are intended for use by NPP operators to assist in managing the risk of knowledge loss.

- These processes and tools are easily adaptable and can be modified to meet the needs of a wide range of organizations.

- It should be emphasized that knowledge management is *not* intended to replace existing systems, processes or programs but rather to increase the overall benefit by providing an integrated approach to manage knowledge loss

Thank You
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