IAEA-TECDOC-1204

A systematic approach to human performance improvement in nuclear power plants: Training solutions

INTERNATIONAL ATOMIC ENERGY AGENCY

March 2001

The originating Section of this publication in the IAEA was:

Nuclear Power Engineering Section
International Atomic Energy Agency
Wagramer Strasse 5
P.O. Box 100
A-1400 Vienna, Austria

A SYSTEMATIC APPROACH TO HUMAN PERFORMANCE IMPROVEMENT IN NUCLEAR POWER PLANTS: TRAINING SOLUTIONS
IAEA, VIENNA, 2001
IAEA-TECDOC-1204
ISSN 1011–4289

Printed by the IAEA in Austria
March 2001

FOREWORD

In 1996, the IAEA published Technical Reports Series No. 380, Nuclear Power Plant Personnel Training and its Evaluation: A Guidebook. That publication provides guidance with respect to development, implementation and evaluation of training programmes for all NPP personnel. The IAEA International Working Group on Training and Qualification of Nuclear Power Plant Personnel recommended that an additional publication be prepared that provided further details concerning the training of NPP personnel on non-technical or soft skills. This report has been prepared in response to that recommendation.

In the past, much of the focus of formal NPP training and development programmes was on the technical skills of NPP personnel, particularly those of control room operators. The environment in which NPPs operate is continually changing; placing new demands on NPP personnel to work more efficiently and effectively while continuing to maintain the high levels of safety required of NPPs. In this report, an integrated approach that considers training along with other ways to achieve desired levels of human performance is suggested.

The IAEA wishes to thank all participants and their Member States for their valuable contributions. The IAEA is particularly grateful to the Government of the United States of America and Northeast Utilities for hosting a consultants meeting on this topic from 24 to 28 May 1999. The IAEA officer responsible for this publication was T. Mazour of the Division of Nuclear Power.

EDITORIAL NOTE

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CONTENTS

1. INTRODUCTION

1.1. Focus of this report

The purpose of this report is to provide nuclear power plant (NPP) managers, training specialists and human performance specialists with information on how they can improve overall NPP performance by enhancing the performance of personnel. While the main focus of this report is on the use of training to enhance NPP personnel performance, it is important from the outset to reinforce the context in which training needs to be considered. The graphic below shows a systematic approach to human performance improvement in the context of the safe and reliable NPP performance:

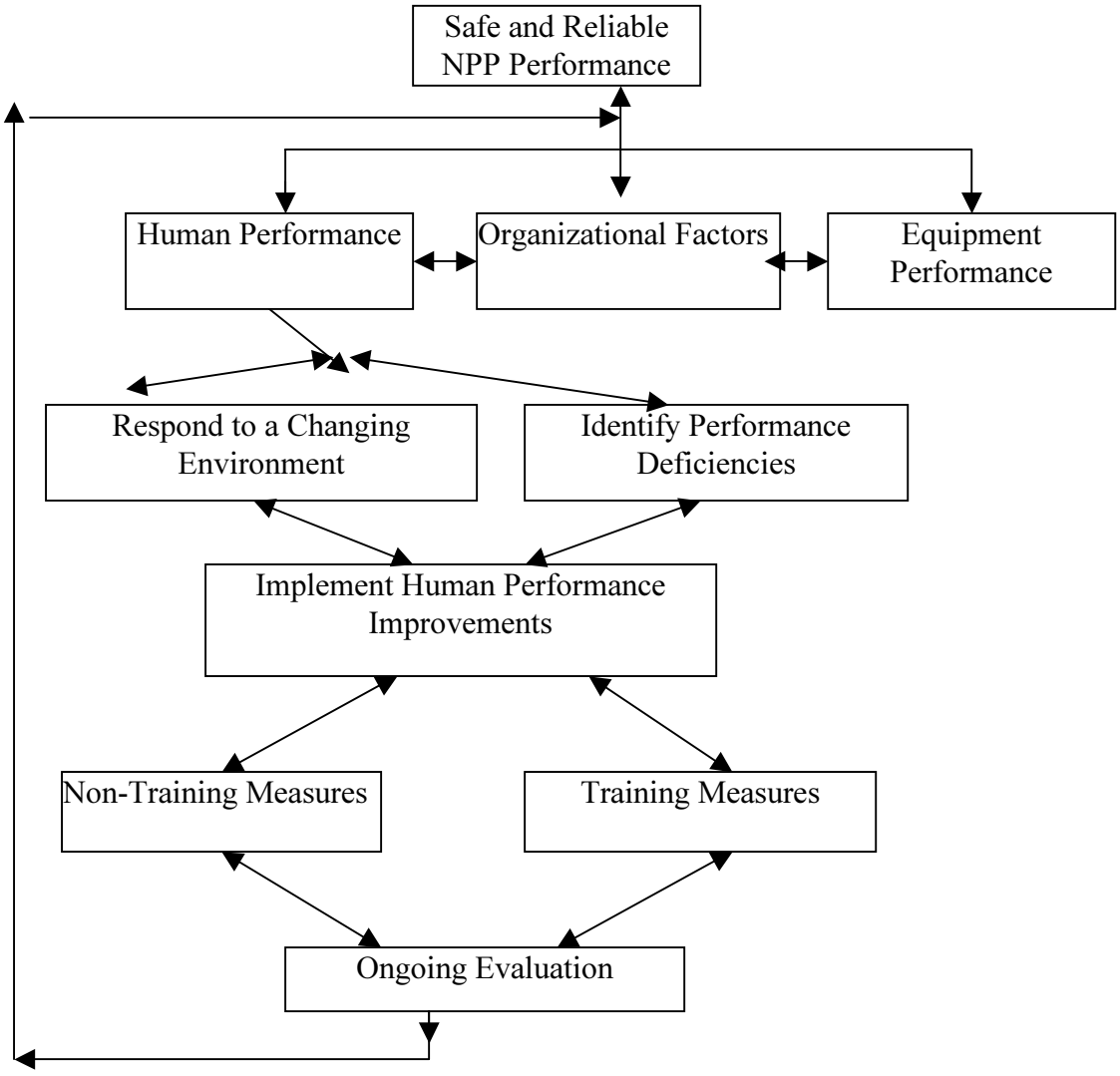

FIG 1. Context for human performance improvement.

Figure 1 shows that the integration of organizational factors, human and equipment performance are needed for effective NPP performance. Furthermore, it shows that human performance depends on both NPP personnel having the individual competencies[*] needed for effective performance and on having appropriate organizational factors to support individual

[*] "Competencies" are defined in this document as groups of related knowledge, skills, and attitudes needed to perform a job in an effective and efficient manner to an established standard.

NPP personnel in carrying out their assignments. Said another way, a perfect training system that provides all the competencies needed by NPP personnel won't necessarily result in the human performance needed to provide safe and reliable NPP performance unless organizational conditions are in place such as: appropriate supervision; oversight and checking; an organizational culture that rewards needed performance; and effective plant procedure systems.

The principal reason for making this point at the beginning of this report is the tendency in many organizations to assume that a lack of training is always a cause of any human performance discrepancy. Rarely is it said, for example, that the system does not provide adequate incentives, or that the quality of supervision is poor, or that the individual does not have the right tools and equipment, or that there are inadequate procedures, or that management has not created the right environment in which staff may perform effectively. Many experienced managers and trainers now realize that for training to be fully effective these factors must be given the proper attention If fundamental issues are at stake, such as counterproductive organizational structures or incompatible organizational processes, then these must be attended to through organizational redesign or strategic alignment, before investments in training can achieve desired results. Also, it is important to recognize that to be effective in an organization, a person's values must be compatible with the organization's values.

Finally, the focus of this report is not specifically on technical competencies. While, technical competencies are very important in achieving needed performance levels of NPP personnel, a good deal has already been written about technical competencies in IAEA and other documents (see references [1], [3], [4], [5], [6], and [7]). Considerably less focus has been provided on competency areas such as:

- Open communication
- Teamwork
- Leadership
- Adaptability
- Problem resolution
- Safety conscious focus
- Business focus
- Professionalism

These competencies areas have been given a variety of labels including "soft skills," "core competencies," "non-technical skills," and "human-factor related competencies." In this report the term "soft skills" has been selected. These soft skills have for some time been considered necessary for managers. Now in many organizations they are recognized as also being important for individuals at all levels.

1.2. The need for human performance improvement

One important aspect of improving human performance is to eliminate incidents/events resulting from human errors. This focus is clearly communicated in an effective way by the Institute for Nuclear Power Operations (INPO) in reference [8]. In the more competitive environment in which NPPs in many Member States are now operating, reducing human

errors is a necessary step in improving human performance. However, NPP personnel must now also find better ways to do work, and avoid doing unnecessary work. Increasing pressures on cost have caused many organizations to "de-layer", resulting in flatter structures with less "middle" managers to exercise control. In this environment, an emphasis on soft skills becomes even more important because effective organizations are built more on trust. This doesn't mean that everyone likes one another, but rather that they understand and value the potential contribution that everyone in an organization can make to its success. Some Member States are also experiencing a more diverse workforce and this adds to the need for more understanding, adaptability, and teamwork among this diverse workforce. Additionally, in today's environment for nuclear power, there are several factors that are contributing to the need to focus greater importance on all aspects of NPP human performance:

— NPP operating organizations are losing staff to other industries or, particularly in the case of managers, to other NPPs
— a significant fraction of the workforce at some NPPs will soon be retiring
— personnel are in the same job positions for long periods resulting in a loss of motivation and skills
— college/university programmes on nuclear power technology are being reduced
— many bright young people are not attracted to the industry as a career choice

All of these factors point to focusing on soft skills so as to do as much as possible to continue to make work at NPPs rewarding and satisfying to the people who now work there, as well as being an attractive work choice for prospective employees.

This report takes a broad, all inclusive perspective as to what "training" is. In this report, traditional classroom, laboratory, and simulator training methods are addressed as well as mentoring, job rotation, coaching, pre-job briefs, "just in time" training and structured on-the job training (OJT).

Also addressed is the perspective of a learning organization, where a focus is maintained on continuous learning by both the organization and by individuals within the organization.

1.3. How to use this report

This report is intended for two principal audiences: (1) NPP managers, and (2) training specialists, organizational development specialists and human performance specialists. It is recommended that each audience use this report as follows:

* **NPP managers** should read Sections 1 and 2, and the examples described in the selected annexes appropriate for their needs.
* **Training/human resource development specialists, organizational development specialists and human performance specialists** should read the entire report with particular focus on Sections 2, 3 and the Annexes. This will provide these specialists with examples of good practices and the methods that can be adapted to develop processes suitable for their organizations.

This report provides examples and information based upon the experiences in a variety of Member States in a similar way that Reference [9] (IAEA-TECDOC-1024, Selection, Competency Development and Assessment of Nuclear Power Plant Managers (1998)) did for

NPP managers. Thus, if readers are primarily interested in soft skills development for NPP managers they are referred to Reference [9] for additional information.

Each organization should carefully consider implementation of the methods and ideas presented here in the context of their national and organizational cultures, status of their nuclear programme, and available training services and facilities. Where appropriate, IAEA workshops/seminars, advisory missions, and expert missions could assist in implementing such programmes.

2. A SYSTEMATIC APPROACH TO HUMAN PERFORMANCE IMPROVEMENT

2.1. Description of a systematic approach to human performance improvement

Figure 2 provides a graphical representation of a systematic approach to human performance improvement. This graphic shows that there are two main sources of needs for human performance improvement; (1) due to changes in the environment, (such as transitions from a monopoly to competitive energy market, changes in nuclear safety standards or regulations and changes in government policies or strategies) and (2) identified deficiencies in human performance. These two sources are complementary in that the first is proactive, attempting to anticipate factors that will necessitate improvements/changes in human performance, while the second reacts to identified weaknesses in human performance. The discussion following Figure 2 in the remainder of this section explains in further detail each of the main steps of this systematic approach.

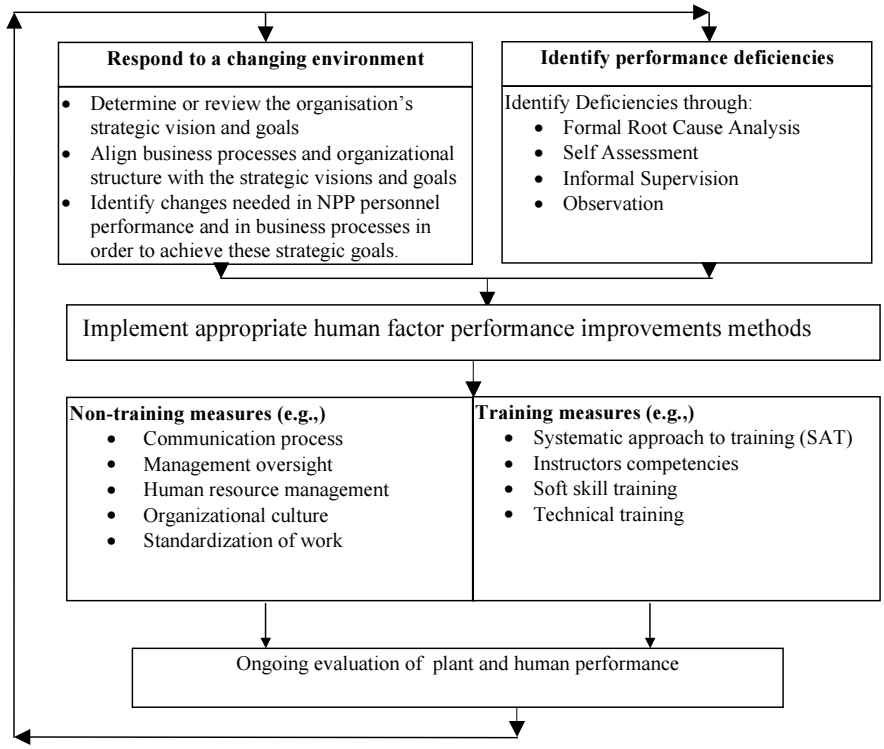

FIG. 2. Systematic approach to human performance improvement.

2.1.1. Respond to changing environment

In the case of a changing environment, it is necessary first of all for the organization to determine how this environmental change will affect its strategic vision and goals, and then to align it business processes, if needed. While, it is recognized that NPP operating organizations will have different strategic visions and goals depending on their particular circumstances, shown in Table 1 are examples of strategic goals of some NPPs/operating organizations in Member States and associated relationships to business practices that were developed in response to changes in their environment.

Table 1: Example of strategic goals/business practices

Strategic Goal(s)	Status of Existing Business Processes	Element
Implement multi-skilled and multi-functions teams while at the same time reducing the number of levels in the organization.	Hierarchical Functional/specialized Rigid	Workplace organization
Broaden the responsibilities of NPP personnel in order to improve their efficiency and effectiveness, and reduce the number of turnovers of work to others, which reduces errors.	Narrow job responsibilities Do one job	Job design
Improve communications in all directions (vertically and horizontally)	Top down communications Information provided on a "need to know" basis	Communication structure

2.1.2. Identify human performance deficiencies

Most organizations already have methods in place to identify human performance deficiencies as part of their incident investigation and reporting systems. In these cases, it is important to emphasize the proper identification of the root cause(s) instead of assuming that the root cause of human performance deficiencies is inadequate training. In other cases human performance deficiencies can be found using methods other than formal root cause analysis, such as supervisory observation or self assessment. For example insufficient individual or team competencies can often be identified through a job observation while determining the cause(s) of a plant trip will generally be found more easily through a formal root cause analysis.

2.1.3. Implement appropriate human performance improvements

An important consideration in this step is to anticipate barriers to achieving these improvements and develop ways to mitigate those barriers. For example, employees, particularly older workers, may feel threatened by attempts to broaden their skills in order to increase flexibility in work assignments. However, if this concern is anticipated, then measures can be developed such as incentives for skill broadening and demonstration of personal benefits such as having greater career opportunities. Human performance improvements will be both those related to improving competencies or developing new competencies, for which training measures will be implemented, and non-training measures such as improving the organization of work activities. It is important that an integrated approach is taken in introducing these measures to ensure that they are effective. For example, if a reorganization is planned which will result in individuals in some parts of the organization needing new competencies, training needs to be integrated into the planning for the reorganization in such a way that it is provided at the appropriate time and in the appropriate way. For example, if the change is to introduce new word processing software into an organization then a lot of training months in advance of implementation about details of the software, is not likely to be beneficial. For all improvements associated with human performance it is recommended that a systematic approach be used to analyze, design, develop, implement and evaluate the needed changes. References [1], and [10] provide additional information with respect to the Systematic Approach to Training (SAT).

2.1.3.1. Methods for implementation of human performance improvements

It is widely recognized that implementing change, particularly dramatic change, is one of the most difficult challenges for an organization's management. No one implementation method can guarantee success under all circumstances. Each method has its strengths and limitations. However, recognizing in advance the strengths and limitations of the selected method(s) can be helpful in allocating efforts to oversee implementation progress. Shown in Table 2 are some example methods along with their associated strengths and limitations.

2.1.3.2. Non-training measures

The role of non-training measures in the improvement of human performance needs to be considered. For example, the enhancement of organizational factors has been demonstrated to have a significant influence on human performance. These include:

* Communication
* Management attention and checking
* The standardization of work
* Human resource management
* Organizational culture
* Organizational structure

Table 2. Methods for implementation of human performance improvements

Method	Strengths	Limitations
Horizontal slice. Pick one level in the organization and work with all of them, then move to other levels	• Individuals in each horizontal slice have similar needs • Individuals can relate easily to one another	• It is often difficult for individuals at just one level in the organization to effectively implement a change; this can lead to frustration and resentment among those who are trying to make the change • The change may be viewed as a threat by those not involved, particularly supervisors
Vertical slice. Pick one organizational unit, and work with all of them (or selected members of the unit) and then move on to other units.	• Avoids the frustrations discussed above for individuals at a particular level in the organization • Individuals can relate to one another because of their organizational ties, and teamwork can be enhanced with the organizational unit	• Having different methods and systems in place simultaneously for various organizational units can be difficult, particularly if there are considerable interactions among organizational units • Some people may react negatively to being involved in the change with their supervisor and subordinates
Pilot implementation throughout the organization. Pick selected persons from a cross section of the organization to participate in the change. Continue implementation in this fashion until all affected persons have been included.	• Permits simultaneous implementation of a programme for all affected organizational units • Most organizations have common problems and issues in all parts of the organization, this provides an opportunity for people to understand that this is the case	• Individuals may not relate well to one another due to organizational and positional differences • Individuals may find it difficult to implement the change in their organizations until a significant number of people have been involved
Simultaneous, flow down(cascading) implementation. Senior managers are involved simultaneously. They then lead the change for their direct reports. These people then lead their direct reports. This is repeated until all affected persons have been involved.	• Allows simultaneous implementation of change throughout the organization • Demonstrates commitment to the change at the top • Provides a way for peers and their supervisors to work together on change implementation	• Not all managers are equally committed to the change nor are the equally effective leaders; thus, the quality of implementation may vary considerably • Considerable commitment of time of managers/supervisors is needed

Some mechanisms to enhance these areas are:

* *For effective communication*: both horizontal and vertical interactions, publication of internal and external newsletters, and cross organizational unit meetings.
* *For management attention and oversight*: management observation in the plant facilitates the identification of human performance issues, as well as a providing a better understanding of the work environment and processes.
* *Standardization of work*: the formalization of policy and procedures in the plant.
* *For human resource management*: performance evaluation, personnel selection, and job rotation are significant processes.
* *For organizational culture*: many concepts such as "STAR" (stop, think, add and review), "doing it right the first time" are a long term investment in changing the way people view their work.

Examples of how NPP operating organizations in some Member States has improved these organizational processes are identified in Annexes A, C, D, I, T U, and V.

Additionally another non-training measure is to select NPP personnel who have certain personal characteristics upon which their competencies can be based (examples of such characteristics are; motivation, trust, and intelligence). It is also important that these personnel maintain positive attitudes toward safe and reliable NPP operation. These areas are discussed in Annexes J, P, R and S.

2.1.3.3. Training measures

Training measures focus on the competencies needed for successful job (and NPP) performance. As indicated earlier, the emphasis in this report is on "soft skills" training. Soft skills training can be implemented through a variety of training settings/methods:

- classroom sessions (using interactive training involving case studies, discussion, etc),
- simulator sessions for operations personnel,
- on the job training.

Experience has shown that in order to be most effective, soft skills should be introduced and developed in the context in which they will be used on the job, not in a theoretical way. Thus, instructors involved in technical training (e.g. simulator instructors) have a significant role to play in soft skills training, in addition to specialists in soft skills training. The technical instructors in charge of such training may need additional instructional skills (and soft skills) training in order to effectively implement this training.

The following is a list of *competency categories* related to soft skills with the expected results related to NPP performance. Following each of these categories is a letter referring to the Annex(es) that provide examples related to the competency category.

* *Open communication* not only reduces errors of NPP personnel but is a key point to changes in the communication structure and in reducing the barriers to achieving these changes (L).

* *Teamwork* will build a climate of confidence between the team members, implement methods to work as a team (as in a multifunctional team), deal with conflict management, and encourage experience feedback to enhance performance (B).

* *Leadership* will help to achieve the goals in an effective way through planning and organization, observation, facilitation *(E*).

* *Adaptability* will facilitate the implementation of technical skills in encouraging flexibility, continuous learning and ability to transfer skills to new working situations (K, R*)*.

* *Safety consciousness* will encourage conservative decision making and use of risk analysis, and will help to identify weak points in organization and human performance *(A)*.

* *Business focus* will enhance employee's sense of responsibility for NPP performance, and develop an understanding of customer needs *(O)*.

* *Professionalism* will help the individual to understand his role in the organization, the most effective ways to carry out this role and why he should do it in a proper manner *(F)*.

* *Problem resolution* will help to identify potential problems and enhance the quality of decision making using team resources (examples related to this competency can be found in the annexes listed below).

Some Annexes in this report provide examples of complete training programmes that address more than one of the competencies above. These include Annexes B, G, H, M, N, P, and Q.

2.1.3.4. Example identification of training measures and related human performance improvements

Table 3 shows an example of the application of the systematic approach to human performance improvement (described in Figure 2) to a particular strategic goal based on response to changing environment. The example is not intended to be a comprehensive discussion of all the issues and methods for implementing a major change, but rather is intended to illustrate the linkage between strategic goals and the training (and related) activities needed to assist in achieving those goals. It is one thing to suggest providing training in an area such as team management competencies without a context in which these competencies may be applied on the job. One can expect that decision makers would not be enthusiastic about such a proposal. However, it is quite another to provide training in team management competencies as part of a systematic process for implementing multi-skilled/multi-disciplined maintenance teams (as shown in Table 3). In this context, training that is focused on effective operation of these teams clearly should be a part of the implementation process, particularly if this is the first occasion that team members have worked in such an environment.

Table 3: Example of a structured approach to human performance improvement

Existing status	Strategic goal	Non training measures	Training measures	Potential barriers to achieving change	Results
Hierarchical, specialized organization	To improve the efficiency and effectiveness of maintenance of plant equipment by implementing multi-skilled and multi-function maintenance teams	Re-organize the maintenance department around types of equipment rather than (or in addition to) maintenance functions Eliminate one level of supervision/management in the maintenance dept. and give maintenance teams greater responsibility and authority for organizing their work	Competencies related to work in a multi-function team including: conflict management; consensus building; information sharing; and providing/receiving feedback Coaching skills Planning and organizing skills, delegation skills, team management skills Technical competencies related to these cross-functional tasks Problem identification skills, problem diagnosis and solution skills, decision making skills	Labor agreements Resistance from supervisors to giving up their positions Resistance from the workforce to doing more work and also to the discomfort of change	Performance in a team environment that includes individuals with complementary, as well as similar skills (e.g. electricians, instrument technicians and mechanics on one team) Greater autonomy and responsibility for work including leadership roles within the team Ability to perform simple cross-discipline activities (e.g., mechanical maintenance worker connect/disconnect electrical leads) Increased responsibilities of individual team members to identify and resolve potential problems

2.1.4. Ongoing evaluation of human performance

It is certainly the case that many human performance improvement initiatives do not initially succeed in achieving their goals. It is only through ongoing evaluation of both plant and human performance that needed corrections in improvement initiatives will be determined. The following are important components of this ongoing monitoring/evaluation process:

* A feedback mechanism is needed. Feedback should come from the performance assessment of the individuals involved in the initiative from supervisors, managers and peers of these individuals, and from the plant performance.
* Results obtained from the feedback process should be trended and tracked over time (including comparison with goals/expected outcomes).
* Plant performance data collected from daily operations for operating experience review purposes should be reviewed to identify human performance deficiencies.

With the ongoing evaluation of human performance by the mechanisms described above, a plant can learn a lot from its past performance. If this information, along with comparisons with the practices of other organizations, is used to continually improve performance then the plant is a learning organization.

3. EXAMPLES/CASE STUDIES

NPP operating organization personnel experienced in the development and implementation of human performance improvements advised that one of the best ways to disseminate lessons learned information is through examples. Thus, a major part of this report is devoted to such examples provided as Annexes. The 21 Annexes listed in Table 4 are provided from operating NPP operating organizations in 11 Member States.

Table 4. Annexes

ANNEX	TITLE
Annex A	Northeast Utilities/USA
Annex B	EDF/France shift teams
Annex C	Culture alignment project at Ontario Power Generation-Nuclear/Canada
Annex D	EDF/France human factors training
Annex E	PP&L/USA — Leadership academy
Annex F	PP&L/USA — Maintenance personnel training
Annex G	INSP/DOE/USA training assistance to Soviet-designed reactor sites
Annex H	PP&L/USA nuclear department new supervisor training program
Annex I	Kanupp operations personnel training

Table 4 (cont.)

Annex J	Kozloduy NPP, complex psychological method for assessment
Annex K	Group dynamic video-training at the Kozloduy NPP
Annex L	EDF operational communication during "real working conditions"
Annex M	Some aspects with respect to the training of Romanian NPP personnel, on human factor related competencies
Annex N	Human factors in the Ukrainian nuclear energy industry: Soft skills training
Annex O	Eletronuclear Brazil: Manager development program
Annex P	Slovakia: MCR operator selection and their training for "managerial skills"
Annex Q	Russian Federation, Smolensk Training Centre: Programme of personnel training in the area of human factors
Annex R	Experience of operational personnel support programme at Russian NPPs
Annex S	Methods and procedures of entry professional selection for Ukrainian NPP operational personnel
Annex T	Guangdong Da Ya Bay training NPP policy
Annex U	Commercial awareness training in British Energy
Annex V	Activities of the Paks NPP related to human performance improvements
Annex W	Increasing awareness of human factors in the Paks NPP via psychologically based training methodologies

4. KEY CONSIDERATIONS

The following are felt to be the most important key considerations in developing and implementing a human performance improvement program:

* *Commitment*. Commitment of personnel at all levels is necessary to achieve the implementation of the measures taken to improve human performance. This commitment must be strong not only at the very senior levels of the management but also at the other levels. Also, this support must be consistent throughout the implementation process.

* *Systematic approach*. A Systematic approach to human performance improvements helps to find areas where human performance deficiencies are strongly identified. Training and non-training measures can only be effective when it is an integral part of an overall system for human performance improvement and should be implemented in all the different areas of the organization.

* *Integration*. Human performance improvement can be performed not only through classroom lectures on soft skills training, but also through its integration in formal technical training in areas such as communication, teamwork and problem resolution (e.g. simulator training). Human performance improvement could be more effective if soft skills training is provided in the context of the real work environment.

* *Cultural differences*. The annexes attached to this report are examples from various Member States of how they improved human performance. It is important to remember that these examples are based on the cultural and organizational norms of these organizations and they may not be successful in every other country. Consideration of each organization's own culture and needs should be given in evaluating these ideas.

GLOSSARY

Adaptability. The ability to be flexible in new surroundings or situations.

Business focus. When employee's assist an organization to achieve its goals and objectives; including those related to the profitability of the company.

Competencies. Groups of related knowledge, skills, and attitudes needed to perform a job in an effective and efficient manner to an established standard.

Core competencies. Competencies that are common to all employees of an organization (or to particular organizational units) and that are considered vital to the success of the organization.

Environmental factors. Those factors external to an individual which influence the behavior of that person (e.g. economic conditions, organizational climate).

Human errors. Inadequate system performance for which a root cause is found to be the result of errors of omission or errors of commission, rather than equipment failure.

Human performance. The behavior of the people in a system with a focus on understanding the general behavior of people within the system, rather than on the behavior of any one individual.

Human performance specialist. A person who is trained/educated/experienced in the performance of people within a system.

Human-factor related competencies. (see soft skills).

Leadership. Ability to guide, motivate and influence personnel to meet the organization goals.

Non-technical skills. (see soft skills).

Open communication. An environment in which individuals are encouraged to transmit their opinions and ideas to peers, supervisors and subordinates.

Organizational culture. The values, attitudes and opinions of individuals in an organization, often describe as the "personality" of the organization.

Soft skills. Those competencies that are not related particularly to the technical aspects of a job, but rather are related to other complementary aspects, such as communication, leadership, working with others, and having a safety conscious focus.

Teamwork. When two or more individuals are working together in all ways to meet the same objectives.

Learning organization. An organization that uses past performance and the experience of others to improve its future performance.

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Appendix

LIST OF "SOFT SKILLS" COMPETENCIES

The following is a list of the competencies related to soft skills identified in Section 2 along with a brief definition/explanation of each competency. It is important to recognize that the standards associated with these competencies should be applied based upon the needs of specific job positions in the organization. The competencies are shown in bold, followed by a brief explanatory description.

(1) Open communication

(a) **Speaking candidly, concisely and articulately**. Both the ability to speak candidly, concisely and articulately as well as the motivation to do so.

(b) **Networking**. Sharing and exchanging information and experience to the mutual benefit of all members of an organization.

(c) **Listening skills**. Willingness to listen and consider the opinions of others, especially important for line managers so that they can effectively sum up all information available to them before deciding on a proper course of action.

(d) **Writing skills**. Developing the skills required to convey the written message in an uncomplicated, accurate format, clearly directed at the intended reader, in order to produce quality reports, standards, procedures, appraisals etc.

(e) **Conducting effective meetings/presentations**. This includes both directing and participating in meetings to encourage a free flow of information and ideas, as well as using effective presentation techniques.

(f) **Using non-verbal communications**. Avoiding the use of non-verbal expressions that may be open to misinterpretation (in a team environment a simple facial expression or shrug of the shoulders may indicate to the recipient some disrespect for their opinion or suggestion, which may in turn cause that person to withhold their opinion or suggestion on subsequent occasions).

(g) **Using feedback**. Ability to use feedback information as a check before proceeding further, or to use the feedback information to better plan future actions.

(h) **Seeking involvement**. Ability to be a useful member of an organization by being active, seeking involvement, offering opinions, suggesting plans of actions, assisting in diagnostic processes and decision making etc.

(i) **Distinguishing fact from opinion/feelings in communication**. This competency includes not only the ability to sense these differences, but also the skills to follow up on communications to ascertain whether they are fact or opinion.

(2) Teamwork

(a) **Encouraging and demonstrating team spirit**. Developing a sense of belonging, a feeling of mutual respect among team members, a sense of loyalty to the team and a desire to complete team tasks efficiently and effectively.

(b) **Developing one's self and others**. Striving to improve the team/organization as a whole, by fostering good relationships, improving individual and team/organizational skills and confidence levels.

(c) **Readiness to consult others**. Being modest enough to ask for help from others in order to solve problems, without feeling a sense of inferiority.

(d) **Being available to others**. Readily encouraging consultation, freely exchanging ideas, soliciting comments and opinions from others.

(e) **Understanding other team members' work and roles**. Being cognizant of the duties and expectations required of others in the team/organization especially when having to interact within the work environment, recognizing also the limitations of those duties.

(f) **Managing conflict**. Ability to anticipate potential areas of conflict, technical or personal, and to act rationally to minimize the possible effects on the team/organization.

(g) **Willingness to provide and accept constructive criticism**. Ability to listen to criticisms of ones actions, to accept and give constructive criticism in a favorable manner.

(h) **Providing feedback**. Ability to analyze information, rationalize the required actions and provide necessary feedback to the initiator of the information.

(i) **Willingness to ask for feedback**. Requesting feedback, following the performance of an action, to confirm its success/failure/outcome.

(j) **Understanding diversity in human behavior** . Acknowledging that people have varying opinions, personalities, judgmental ability, sense of urgency, ability to operate in stressful conditions and ability to make sound decisions under varying stressful conditions.

(k) **Building consensus**. Ability to encourage work colleagues to share common goals and to reach consensus conclusions.

(3) Leadership

(a) **Dealing with ambiguity/uncertainty**. Ability to recognize ambiguous instructions or situations and to correctly interpret them.

(b) **Results oriented**. Ability to focus on and successfully conclude a task.

(c) **Coaching**. Recognizing the need to improve the knowledge of others and sharing one's own knowledge and experience to accomplish this.

(d) **Observation skills**. Ability to observe activities in such a way as to draw appropriate conclusions as to whether they are functioning as intended.

(e) **Planning and organizing**. Ability to plan and organize the conduct of tasks in such a way that they can achieve a desired goal.

(f) **Delegating**. Ability to share out work by assigning tasks to others.

(g) **Using progressive (positive) discipline**. Enforcement of rules through progressively stronger methods in a way that provides positive motivation toward compliance with these rules.

(h) **Maintaining a command presence**. A way of acting that suggests one is in charge of a situation.

(i) **Praising, encouraging and motivating others**. Showing appreciation where due, while seeking constructive input from the workforce so as to maintain their positive motivation toward their tasks.

(j) **Facilitating**. Assisting others to achieve their assigned tasks through providing answers to questions, questioning or other methods.

(k) **Managing teams/groups.** Ability to direct a team or group in achieving its goals in an efficient and effective manner, including the ability to control a group in the event of an extraordinary situation.

(l) **Resolving conflict**. Recognizing and resolving conflict in the workplace and particularly in a team/group environment, where a desired course-of-actions may be inhibited because of dissent or aggression between members.

(4) Adaptability

(a) **Willingness to change**. Ability and motivation to adapt to, or improve ones harmonization within a group; ability to accept alternative means of accomplishing a task to the overall benefit of the group.

(b) **Maintaining task focus during change**. Ability to remain cognizant of the intended goals and to complete tasks, when deviations from the original plan are necessary.

(c) **Learning continuously**. Continually seeking further knowledge and striving for improvement.

(d) **Being flexible/adaptable**. Ability to readily adapt to new conditions, teams, or tasks and to be receptive to new ideas or opinions.

(e) **Transferring skills to new situations**. Having both the flexibility and first principles knowledge/skill to be able to apply these principles to similar/related situations.

(f) **Being adaptable to the environment**. Ability to move between differing work conditions and readily adjust to a changing work environment.

(g) **Understanding one's own limits**. Recognizing one's own fallibility and staying within in the bounds of one's own capabilities.

(5) Problem resolution

(a) **Identifying problems**. Ability to recognize potential problems and appropriately report them.

(b) **Recommending improvements**. Ability to enhance the organizations or teams operation by seeking and recommending improvements.

(c) **Diagnosing and solving problems**. Ability to use analytical, logical methods to identify the sources of problems and their solutions.

(d) **Making decisions**. Ability to collect appropriate information about a problem and make an appropriate decision as to resolving the problem. Ability to take reasonable risks and make effective decisions within a limited time and with a lack of complete information.

(e) **Being innovate/creative**. Ability to complete tasks and resolve problems when conventional actions or resolutions are not apparent.

(6) Business focus

(a) **Keeping a broad perspective.** Ability to understand the relationship between individual tasks and overall business goals.

(b) **Focusing on customer needs.** Maintaining an understanding of who the customer(s) is (are) for a particular activity, and how the customer perceives the benefits of this activity.

(c) **Maintaining a commercial/business focus.** Maintaining an understanding of the relationship between one's work in an organization and how it relates to the profitability and health of the organization.

(d) **Ownership.** The extent to which one feels responsibility for an activity.

(e) **Healthy pride.** Pride in one's work/organization that results in a positive attitude toward the organization, while at the same time not being unaware of faults/problems.

(f) **Taking appropriate business risks.** Ability, after carefully studying the benefits and potential consequences of a business situation, to make a decision in consideration of the associated risks and benefits.

(g) **Being accountable.** Being held responsible for one's actions.

(h) **Maintaining a healthy competitiveness.** Being motivated to compete with other individuals and organizations while at the same time recognizing the limits of this competiveness so as not to undermine fundamental values.

(7) Safety conscious focus

(a) **Checking continuously**. Continuously monitoring conditions by regularly reviewing available indicators.

(b) **Maintaining a questioning attitude**. Not accepting everything at its face value; questioning administrative directives, operational decisions or plans of actions seen as being inefficient or incorrect, and bringing the disagreement/suggested solution, with rationale, to the attention of the responsible person.

(c) **Maintaining safety consciousness**. Being constantly aware of possible safety implications during the planning and implementation of tasks.

(d) **Making conservative decisions**. Maintaining a steady organizational direction, preferring minor adjustments rather than rapid and significant change; erring on the side of safety in operational decision making; consulting others where possible before making major decisions.

(e) **Using risk analysis tools**. Ability to calculate risk probability, or taking the probability of risk into account, in order to minimize/reduce operational/production related risk factors.

(f) **Escalating concerns/challenging decision making**. Continuing to pursue safety concerns or deficiencies, by upward reporting, aggressive follow-up or other actions until satisfactory resolution is obtained.

(g) **Intelligently following procedures**. Avoiding hasty decisions, unsafe situations or unplanned transient conditions by using approved procedures. Not equivalent to blindly following procedures, but rather thinking while using procedures.

(8) Professionalism

(a) **Maintaining a quality focus**. Continually striving for excellence in all aspects of the workplace

(b) **Maintaining self control/self-discipline**. Ability to function appropriately especially under stressful conditions; able to maintain a focus on task completion, particularly during times of distraction or difficulty.

(c) **Maintaining high work standards**. Constantly setting and achieving high ethical and performance standards in the workplace.

(d) **Self awareness**. Consciously aware of the factors that are influencing one's actions and decisions.

(e) **Being self critical/willingness to admit mistakes**. Willingness to acknowledge imperfections in one's own performance

(f) **Maintaining attention to detail**. Striving towards perfection, fulfilling every aspect of the task by continual self-checking, to confirm complete and accurate accomplishment.

(g) **Willingness to apologize**. When one has been wrong or has offended another.

(h) **Agree to disagree**. Ability to adhere to ones opinions while respecting the rights of others to do likewise.

(i) **Health consciousness**. Willingness to maintain ones mental and physical alertness in the workplace and practicing moderation during social activities.

(j) **Respectful of others/value differences**. Ability to display attentiveness, interest and politeness to superiors, subordinates and business colleagues alike, and to appreciate the value in having different perspectives in a group.

Annexes

A–W

Annex A

NORTHEAST UTILITIES/USA

Regulatory focus: Safety conscious work environment

Need

Why was there a need to improve human performance?

On October 24, 1996, the United States Nuclear Regulatory Commission (NRC) issued to Northeast Nuclear Energy Company (NNECo), an order to "develop, submit for NRC review, and begin to implement a comprehensive plan for (a) reviewing and dispositioning safety issues raised by its employees and (b) ensuring that employees who raise safety concerns are not subject to discrimination." Additionally, the Order required NNECo to address "root causes" identified by key NRC and NNECo review teams, "with the objective of achieving a safety-conscious environment". At the time this order was issued all three Millstone reactors were shut down and this order forbade restart of any of the units without successful completion of the order's terms and explicit NRC permission.

Organizational attributes

Millstone Nuclear Power Station is a three reactor NPP site located in Waterford, CT, USA.

Current situation/context plus recent past

Millstone Nuclear Power Station recently completed an extensive recovery from a regulator mandated shutdown. The site was identified as having substantial operational and cultural weaknesses that required remediation for continued power operation. Northeast Utilities, the parent company of Millstone, spent over one billion dollars in order to remedy plant problems and bring the station back on the line

Implementation approach

How was it done? (Not only training, but also related changes)

The NRC order which identified the loss of a safety conscious work environment at Millstone, and required its reinstatement prior to plant re-start also mandated the development of a comprehensive remediation plan. The required plan was developed by a group of volunteer Millstone employees. The plan which the group developed consisted of six (6) major elements. They were interdependent with one another and were meant to enhance management/employee relations while not usurping management prerogatives. Those elements were:

- A commitment to rebuilding employee, regulatory and public trust,
- Training and orientation to provide specific skills to reinforce a healthy employee management relationship with respect to employee concerns,
- Specific organizational, policy and procedure changes,
- Development of performance action items that assigned responsibility for implementation of the plan,
- A new employee concerns program and,
- Creation of a concerns oversight panel.

What was the content?

A number of initiatives and actions were taken to support the establishment of a SCWE. These actions, including major Millstone leadership changes, addressed the root causes of the degraded SCWE at Millstone:

(1) Issuance of an NU Nuclear Safety Standards and Expectations Policy.
Enhancing programs that play a major role in creating expectations and providing a foundation for meaningful cultural change. These include:
- leadership training;
- procedural quality and adherence;
- corrective action program;
- self-assessment program.

(2) Restructuring the employee concerns program (ECP).

(3) NU leadership defined its expectations, clearly communicated them to Millstone personnel, and increased personnel accountability.

(4) The Northeast Utilities Nuclear Safety Standards and Expectations document, which articulates the principles underlying NU operations, was issued on May 28, 1997.

(5) The President and CEO Nuclear issued a SCWE Policy on August 7, 1997. This policy conveyed his expectations for handling of employee concerns. Also in August, the set of 18 SCWE characteristics was issued.

(6) NU also formally adopted the four core values that are common throughout the Northeast Utilities System; the section pertaining to the nuclear group roles and responsibilities was revised.

Methods?

Training programs — summary

NU management has implemented a site-wide training program in support of the activities related to Safety Conscious Work Environment (SCWE). These training programs are aimed at creating an environment where:

(1) Employees and contractors feel comfortable with their roles in helping to maintain a safe workplace.

(2) Recognizing and raising safety, technical, and quality issues or concerns are vital part of everyone's job and a necessary component of NU operation. Since everyone who works at Millstone has a role in contributing to a SCWE, specific training programs have been developed and conducted for NU employees including the contractors. Many of the training programs are ongoing and refresher courses are provided periodically as needed.

The Vice President of Human Services is responsible for the day to day implementation of SCWE activities. A full time SCWE Issue manager reports to him and oversees the whole operation with emphasis on training programs. For newly hired, or assigned, supervisors, managers, and directors a Quick-Start Training Video has been developed to provide an immediate indoctrination into the elements of SCWE, to ensure the needed focus and sensitivity is provided while the overall training is completed.

Further enhancements to SCWE related training are planned. To follow-up and build on the initial SCWE training NNECO is conducting SCWE refresher training for the management team.

The following is a summary of the SCWE related training courses as well as supplemental training programs provided to NU employees and contractors.

SCWE related training programs at Millstone

(1) Managing for nuclear safety (MFNS)

Communicates the manager's responsibilities to foster a workplace environment where employees feel welcome to raise safety concerns in order that NU maintains the highest standards of safety, quality, and integrity in its operation. In mid April 1997, the MFNS training program was revised to include a module on ECP indoctrination.

(2) Civil treatment for employees (nuclear acclimatization).

Participants will be able to describe acceptable and appropriate forms of workplace conduct and behavior that comply with standard civil treatment guidelines.

(3) Partnership beyond 2000 (nuclear acclimatization)

Partnership 2000 is the employee version of MFNS and discusses the importance of raising safety concerns and the employees role in maintaining a hostile free work environment in which employees feel free to raise safety concerns. In mid April 1997, Partnership 2000 training program was revised to include a training module on ECP indoctrination. Incumbent employees who previously attended Partnership 2000, will receive revised ECP indoctrination through the annual Plant Access Training re-qualification program. Upon completion of the course, participants will be familiar with the concept of shared responsibility between employees and supervision in fostering a workplace environment where employees feel welcome to raise safety concerns in order that NU maintains the highest standards of safety, quality, and integrity in its operation 0

(4) SCWE training: 10 CFR 50.7 training, management actions for detection of & response to discrimination issues

Session I: Essential elements of discrimination and management actions to avoid, detect, and respond to such items. Session II: Diagnostic tests, enforcement of fundamentals, and remediation of identified weaknesses. Case studies are discussed. Session III: Site management will address how the principles and attributes of a SCWE will come together at Millstone.

(5) ECP training

ECP staff training has been completed for courses contained in the NU Plan for addressing employee concerns. The training subjects included interviewing skills, legal issues in employment, investigative report writing, investigative planning, time management, effective writing, plant systems, interpretive skills (HEPS/root cause analysis), communicating with regulators and auditors, and team building.

(6) Employee relations training

The objective of his training is to provide supervision with the interpersonal skills and knowledge of NU/Millstone HR policies and procedures necessary to establish and maintain effective employee relations. This includes discussion of:

⇒ Partnership responsibilities between HR and line management
⇒ Employee coaching/counseling
⇒ Personnel performance documentation
⇒ Discipline guidelines (OA-15)
⇒ Grievance and dispute resolution processes
⇒ Recognition/response to claims of retaliation
⇒ Recognition/response to potential chilling effects. This training replaces the old MARC and 50.7 SCWE training

(7) Management workshop: "Focus on a safety conscious work environment".

An NU Leadership meeting was held which over 400 management personnel attended. The focus of the meeting was safety conscious work environment. Topics covered included:

(a) What good leaders need to know about human behavior to develop a SCWE.
(b) The role of Little Harbor consultants (LHC), expectations for addressing employee concerns.
(c) Protected activities, chilling effect, SCWE success criteria for restart, role of ECP for restart and beyond, ECOP's role in a SCWE, looking into the future and lessons learned from South Texas.

(8) Management workshop: "Eliminating harassment, intimidation, retaliation, and discrimination"

An NU Leadership meeting was held with over 400 management personnel attending. The focus of the meeting was eliminating HIRD at Millstone station.

(9) Management action response checklist (MARC) training.

The objectives and expectations of the MARC training initiative which was an outgrowth of NU's Nuclear performance Enhancement program were:

(a) Enhance, develop, and improve skills in communications and interpersonal relations;
(b) Enhance, develop, and improve people skills such as work assignments and directions, performance evaluation, feedback, coaching, and counseling, and implementing corrective actions;
(c) Improve understanding and consistent application of NU's Personnel Policies and procedures;
(d) Improve grievance and complaint handling skills;
(e) Improve fact finding, documentation and employee discipline administration skills;
(f) Build from the MARC training an employee relations management system for the future and institutionalize the MARC concepts within the Company. This has been superceded by employee relations training (see #6 above).

(10) Forum for leadership excellence (FLE)

These training courses were conducted for two of the Millstone Units. The FLE program provides an integrated approach that is focused on building skills and educating managers and supervisors throughout the Millstone Station. The objectives of the FLE program are four-fold:

(a) To provide opportunities for managers and supervisors to learn new ways of thinking, doing, and behaving to better assume and manage their segment of the business;
(b) To provide opportunities for participants to understand the current and future business context and strategies of their corporation to better function as business partners within the management team;
(c) To provide opportunities for managers and supervisors to build collaborative work alliances in and across the organization;
(d) To provide opportunities for managers and supervisors to practice, integrate, and to quickly transfer their leanings to on the job situations.

Millstone also performs two different types of surveys to assist in measuring the SCWE at Millstone. The first is a general culture survey that provides information regarding the general work environment and the safety conscious work environment. The culture survey is structured to obtain feedback in six areas:

⇒ Mission and goals
⇒ Knowledge and skills
⇒ Simple work processes
⇒ Lateral integration (teamwork)
⇒ Self improvement
⇒ Safety conscious work environment (SCWE)

Leadership development (leadership assessment) survey

The Leadership Development Survey is given periodically to Millstone leadership to provide feedback on their strengths and weaknesses. A Guide has been developed to accompany feedback results from the Leadership Development Survey. It is provided to each person surveyed to help make positive and productive use of the Survey information. capable. A tool such as the Leadership Development Survey can allow leadership to explore their current development needs, and also provide confidence by reaffirming strengths, thus reinforcing past development efforts.

Results

How did it address the need? Did performance improve?

Millstone has witnessed significant positive results from its SCWE initiatives. Internal surveys, as well as the results of investigations and assessments by third party evaluators, have all documented major improvement. Regulatory approval for the re-start of the Millstone units is a direct result of demonstrated success in this area.

Lessons learned

Transfer of approach to other organizations, and where did it come from?

Many of the interventions associated with the Millstone SCWE effort were internally developed. The Comprehensive Plan which responded to the NRC order was the result of a volunteer employee team which ensured that the numerous components of the SCWE response were tailored to station needs. Consultant programs were obtained after completion of internal needs assessments. It is reasonable to expect that any similar effort would benefit from those closest to the issues having a considerable involvement in program development.

Contact(s)

Organizations and names

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Annex B

EDF/FRANCE SHIFT TEAMS

EDF simulator continuing training session
"real working conditions" for NPP control room personnel

I. Introduction

Originally the continuing training programme for control room personnel was only dedicated to technical subjects, but EDF Nuclear Generating Department and Vocational Training Department found out that the soft skills (non-technical) subjects were the cause of several event reports. Consequently it was decided to train the control room personnel on these subjects. The « real working conditions » simulator session is a part of this « soft skills » training programme.

Historically this training session was put in place in 1984, following an analysis of the difficulties that were demonstrated on the simulator by the control room personnel on emergency and complex situation. In 1989 a working group including the different EDF training centers for NPP personnel was created to define a common method for soft skills training.

The main results of this kind of training were that the shift teams are now aware of the problems that can occur in a group when working together. As the training session is implemented with the actual shift team it helps to reinforce the links between each member and to understand each role. Shift personnel show less and less communication and problems as the team remains the same.

To avoid the unnecessary training and according to the feedback system that is operating between EDF generation and Training departments, a set of recommendations both technical and non technical (soft skills) is sent yearly to the training centres and NPPs to be included in the training sessions so that the training is directly focused on the needs.

The trainers are trained on problem solving during a classroom session where they implement case studies

II. General objectives

This simulator training session, lasting one week, is a part of the control room personnel continuing training. It occurs once per year for the control room personnel as well as a one week training session on technical subjects.

The training week is based on four main directions:

- *Use of the Procedures*
- *Knowledge of everyone's role and team organization*
- *Communication between the participants*
- *Problem solving methodology (individually and as a team*)

The three main objectives of the training week are

- *Trainees will be able to formulate what happened during the simulator session.*
- *Trainees will have built new practices due to the identified problems*.
- *Trainees will have an appropriate analysis method of their practices*.

III. Specific objectives

III.1 - Use of the procedures

The use of the procedures is the key point of a good management of an emergency situation. The training session focuses on this use according to the requirements and recommendations on procedures usage.

The incident analysis that is done jointly with the use of procedures by the shift team during each simulator scenario is also a part of the observations of the trainers. Different plant analysis techniques are analyzed by the trainers to help the team to re-inforced their competencies in this area.

III.2 - Knowledge of everyone's role and team organization

Working in a team must include the knowledge of everyone's role in the team and the importance of the other member as well as the organization of the team.

The shift team must define the roles of each member in the different situation of the plant (normal, abnormal, emergency). As some of the tasks are well define due to the organization of the procedures, the shift team must identify the non-specific tasks that are not taken into account by the procedures and assign these tasks to each member.

As each member of the team has his own role and duties the team must be organized in order to co-ordinate the different roles and to avoid unnecessary redundancies. The limits of the roles during each phase (thinking, decision, action) and the difficulties encountered during the scenario such as facing a decision, procedure interpretation are also emphasized by the trainers

III.3 - Communication

Communication inside the shift team as well as with the other plant departments and also external organization such as regulator or the grid controllers are analyzed and discussed with the team members. This could include the design of a message (accuracy, pertinence, completion), the way the trainees formulate a message (tone, attitude) as well as taking into account a message, the undelivered information (delayed, forgotten information).

The importance of the close relations that could exist between the members of the team (management versus operators or friends working in the same team)

III.4 - Individual and team problem solving methodology

Different aspects of the problem solving are checked during the simulator sessions. These aspects are the following:

- The information needed for problem solving such as: confirmation of information, validation of information, hierarchy of information (which alarm should be taken into account first, which chronology in the different tasks…) and the use of documentation.
- Management of the attitudes inside the shift team such as the consistency of each team member work and attitude compare to the plant situation and the procedure in use. Everyone in the team should have his own judgement and compare it to that of other team members. Emphasis is also given to the fact that "judgement is often subjective" compare to facts.
- The management of the team is very important in solving a problem in emergency situations so the co-ordination of the activities, the actions that a team member performs for another team member (upon demand) and the actions that are delegated to increase the efficiency of the work are elements that trainers observe to enhance problem solving.

IV - Pedagogical method

IV.1 - General presentation

The session is based on three pedagogical key points which are:

- The active method where the trainee is observed without interference from the trainers on simulator and the stimulation of the trainees during the classroom part of the training session where the trainer facilitates rather than instructs.
- Explanation on some technical problems when needed.
- The fact the two trainers work as a team and not as individual.

The training session is presented the first day to the trainees, this includes the training objectives, the method used and the role of the video in order to place them in the best situation to understand the use of such pedagogy.

The scenarios that are used are a part of the scenarios manual which have been developed according to the objectives of the training, the scope of the procedures the experience feedback, the possibility to generate thinking attitudes when using the procedures and the requirement from the EDF Generation Department.

IV.2 - Simulator phase

The simulator phase is design as follows:

- *Setting the session*

  The initial condition of the scenario should include existing problems.
  Unavailable equipment must be notified.
  SS and/or his deputy could be outside the control room.

- *Simulator session*

  The entire session is recorded.
  No interference from the instructors except role playing.
  No freeze, slow motion or acceleration is allowed.

  - ♦ Instructors roles

  One instructor is in charge of the failures and notices the time of the different actions.
  One instructor is in charge of the video and notices the interesting phases.
  Both instructors manage the scenario and the phone calls.

  - ♦ Observation

  One instructor is predominantly in charge of the observations never-the-less, the other instructor can notice important actions.

  The observer has three main tasks:

  (1) Follow in the control room and on the TV screen the activities performed by the team to notice the main points that could be discussed during the class-room analysis.
  (2) Record the session.
  (3) Note down precisely the different mains points so it can be easily used during the classroom analysis.

IV.3 Analysis phase preparation

The analysis phase preparation is design as follows:

- *For instructors*

  Prepare the classroom analysis in:
  - ♦ Focusing on the main points.
  - ♦ Establishing priorities in relation with the objectives and with what was done during the previous days (repetition of a wrong action).

- *For trainees*

  Trainees are encouraged to prepare the analysis phase without the instructors in order to have a feedback of the simulator session.

IV.4 - Analysis phase in classroom

The analysis phase is design as follows:

An explanation is given to the trainees of the roles of the instructor and the training techniques that will be used during the debriefing phase (analysis phase).

The debriefing itself is conducted by one of the trainer who is the leader and the other trainer analyses the situation and give complementary questions to emphasize a specific difficulty raised by the trainees.

The trainers must take care of the limits of their questioning in order to gain confidence and respect from the trainees. The difficulty is that the trainees must find their own errors without being too much helped by the trainers or being accused by them to have made mistakes.

Finally the use of the video must be restricted to some phases where there is no consensus on a fact or to confirm such or such attitude.

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Annex C

CULTURE ALIGNMENT PROJECT AT ONTARIO POWER GENERATION-NUCLEAR/CANADA

Need:

The Culture Alignment Project was formed by the chief nuclear officer (CNO) to help all Nuclear staff understand the intent and direction of many initiatives which were in progress or planned to shape a safe and productive business culture. The health of the business is directly linked to the health of the culture. As the business drives toward improved safety, reliability, and competitiveness, the culture becomes an even more critical element of success.

Here *culture* is loosely defined as "the work environment, attitudes, and behavior s of individuals and the policies and procedures which influence the way we get work done." Culture includes elements such as vision, values, policy, processes, procedures and behavior s. In the current culture, undesirable events are happening on a recurring basis.

The project was conceived with two initial drivers. First, the current culture involves a number of basic dysfunctions that are reducing the effectiveness of needed new programs as they are introduced. Second, there was an acknowledged need to reduce the frequency of serious events (personal security, safety, and production). Each of the three generating stations had already taken steps to introduce some parts of a human performance framework. The managers of these efforts had reached agreement that a concerted and coordinated drive was needed to make substantial further progress. However, there was no overarching strategy to coordinate these cultural programs. It became clear that in order to be able to rationalize and explain the interactions of the various culture initiatives, including human performance, a deeper understanding was required of the current and desired cultures of the business.

A third driver became evident during the project with the launch of Ontario Power Generation — Nuclear. Culture is an enormous business driver and will be one of the key competitive advantages of the new business. Indeed, if the culture is not such that Ontario Power Generation- Nuclear is a highly desirable place to work relative to other industries, the business will not be able to retain or attract the high-end talent it needs to be successful. The timing of this project is fortuitous as it coincides with the launch of Ontario Power Generation, Inc. (OPGI). There is an opportunity for leverage in the area of culture change from the OPGI launch since people are naturally inclined to watch for "what has changed."

Implementation approach:

The project involved a team of nine full time members, two part-time members, and an industry advisor. The three generating stations, Nuclear Operations Support and Services (the head office and training functions), and the Power Workers Union were represented. An oversight board comprised of a diverse cross section of interests supported the project team.

The project team collected data on the current culture from 36 multi-level focus groups; multiple interviews of the senior management team; benchmarking trips to other utilities; and, reviews of previous studies and correspondence. Gathering and assimilating these data required three months of full-time work by the project team (March-May 1999). At the completion of the project, a two-day workshop of the nuclear management team was held. In the facilitated

workshop, implications of the data and how to begin the steps to improve in a number of areas were discussed. The development of plans for the next steps and ongoing monitoring of implementation were assigned to the Employee Services Division.

Results:

The following points were the principal findings of the project team's research and analysis.

- Most people are overwhelmed by the scope and rate of change.
- Many people believe they are not valued and behave as if they were helpless. There is a fear of punishment for honest mistakes.
- Leadership needs to be more effective. Many managers are working below their role assignments; consequently, the needed managerial leadership is often not provided.
- Much line communication is only one-way and lacks sufficient context or understanding.
- There is insufficient managerial contact and meaningful communication.
- Action on identified problems is not timely. Closure is often delayed or not achieved at all.
- New processes are seen as excessively complex; and, implementation problems are not being addressed in a timely manner.

These findings are being considered as symptomatic of a work environment where:

- The business direction as it applies to the majority of people is not well understood. This direction is particularly unclear as it relates to the desired culture, values and behavior s.
- There is insufficient focus on **people** when compared to **plant** and **process**.
- Many people are only engaged in their work in a superficial way.

Lessons learned:

There is an enormous reserve of untapped latent leadership and talent at all levels. This is a high leverage asset in the drive toward safe and reliable production of nuclear electricity in a competitive marketplace. While there is significant dysfunction in the current culture, the nuclear business is poised to make a transformation. This is a destiny issue requiring the engagement of all 10 000 people. Establishment and understanding of a credible cultural vision are the first steps. Such work was started during the senior management workshop. The urgent challenge will be for the CNO Management Team and, ultimately, all staff to translate the cultural vision and the supporting values into tangible and credible behavior s and actions. A high level understanding of the whole business and some degree of overall coordination is needed to avoid compounding the current misalignment. The challenge will be for senior management to quickly develop a common understanding of the "compelling" cultural vision and then to engage all managers in meaningful dialog with 10 000 staff members.

Path forward:

IAEA-TECDOC-1024, *Selection, Competency Development and Assessment of Nuclear Power Plant Managers*, June 1998, contains descriptions of several leadership and management training programs offered by Ontario Hydro. Those training programs have been carried forward into the new company, Ontario Power Generation, and are being used as

primary vehicles to convey the lessons learned cited above. A new course is being developed to better equip the company's managers and first line supervisors to cope with and manage change. That course, too, will incorporate the lessons learned from this culture alignment project. It is felt that the participants in these courses will become sensitized to these factors and, thereby, serve as culture change agents back in their respective work environments. Further, periodic workshops are envisioned for the senior management team to assure continuing sensitivity to its responsibilities in setting the cultural direction for the company.

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Annex D

EDF/FRANCE HUMAN FACTORS TRAINING

Introduction

This training has been developed for nuclear power station operating teams. Analyses of operational incidents have identified the lack of quality of both individual and team operation activities. The main goal of the training was to enhance the quality of these activities. Two ways were implemented, the first one developed personal understanding about working behavior s and their evolution. The second one explored different ways of errors diagnosis during operation.

Background, context

The Nuclear Operation Division has a strong will to enhance economic performance due to the evolution of the increasing competition in the electricity generation in European Union. Moreover, safety requirements from the French nuclear safety regulator have also increased in France due to the increasing demand from the public.

These new requirements have led nuclear plant personal to find ways to reduce the number of nuclear events (rated by INES) and to improve the availability of safety systems.

Method

A new method has been implemented in the Nuclear Power Plant of ST Laurent. It is active training dedicated to improve the quality of operation activities. The operation teams were involved in a deep personal analysis of their collective behavior s and methods. The collective analysis is fundamental to obtain long-lasting results and to avoid individual perception about improvement of operation.

The two parts of this training are a Human Factor theory training and teams workshops focused on real case analysis.

This method is focused on three objectives:

- Allow participants to better understand their day to day behavior during operation as well as their internal regulations.
- Develop communication among participants about their working condition characteristics and methods;
- Take profit of the new learning of participants as well as results of their discussions in order to improve real working situations.

The fundamentals of the method are:

- A training focused on real professional cases analysis
- Theoretical contents are included within sessions when needed.

Instructors taking into account participants feedback in order to customize the training to their personal needs.

The main objective of this training is to develop participants' competencies in order to give them the ability to perform their own analysis of any situation they meet in their day to day job.

Contents

Training lasts 6 days split into three sessions:

(1) Learning phase:

- Human error: the different kind of mistakes, mechanisms that lead to mistake, how to handle a mistake.
- Human dimensions of work: psychological, cognitive, sociological, psychic.
- Work management: organization, social interaction between players, collective regulations.

(2) Case study phase:

Methods are provided through case studies that are prepared during the sessions and continued through observation in their working environment between sessions.

(3) Improvement proposal phase:

Example: How to better manage phone calls during complex phases of operation.

Results

Very accurate indicators are still under investigation. Nevertheless interesting results have already been observed. Participants have been able to give objective feed back of their working condition as well as accurate analysis. Most of participants have moved from an individual to a collective analysis of performance. Participants have developed their awareness of the limits and the unpredictable aspects of human behavior in a working environment. This has led them to better understand the importance to the organization of the reliability of any activity. Favourable and unfavourable working conditions to obtain quality have been emphasized by participants. Participants have developed a common language that allows them to handle questions about their working conditions. In fact, discussions about working conditions have actually taken place as well as team precaution preventing error generators.

Strong points:

The main strength of this training is its ability to give an actual knowledge about human behavior in working conditions. This allows participants to develop their personal understanding as well as other'.

Instructors have been able to adapt to participants needs and have a strong understanding of real life working condition of nuclear plant operation.

Improvements:

First line manager's involvement. First line managers did not feel involved at the beginning. They definitely have a strong role to play in terms of objective understanding and teamwork involvement. They, as managers, are the ones who can leverage the team's involvement by increasing their availability for training preparation between sessions. Consequently first line managers must be given strong incentives to participate at the beginning of the project.

Duration of the training process (goals definition, training presentation to teams, training schedule). The total duration was too long, leading to a certain extent to de-motivate participants. Sometimes decision had to be taken at top management level which took too long.

Success conditions

- Top managers must give clear insights to teams about the goals they want to reach through this training.
- Top managers must be involved in the assessment of the improvement solutions proposed by the teams.
- These solutions must be implemented quickly in order to keep operating teams motivated and confident in the ability of the organization to answer their demands of improvement.

Recommendations

We recommend continuing this type of training, as qualitative indications are that this training has had a positive impact on both safety and availability.

The principle of this active training can be transferred within others environments as soon as:

* the social environment cases people to be motivated to analyze their working behavior and methods.
* top management is involved in the active training.
* personnel are confident in the organization.

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Annex E

PP&L/USA — LEADERSHIP ACADEMY

Introduction

The Leadership Academy experience provides supervisors with an intensive exposure to key leadership principles, theory, and tactics to allow them to meet the challenges of workforce management in an environment of change and competition while maintaining a strong and conservative Nuclear Safety culture.

The curriculum combines strategic leadership principles with tactical skill instruction to enhance the supervisors existing supervisory skills and to develop new skills such as change management, coaching, building partnerships, process mapping, and leading cultural change. The program also provides an opportunity to interact with Nuclear Department Executives and Functional Unit Managers to understand not only the department direction, but the logic, rationale, and external factors which influence our current business plan.

Leadership Academy is conducted full time over a four week period. An academy class contains approximately 15 students. A mix of first and second line supervisors, engineering and craft supervision, site and General Office participants, and a cross functional unit representation is designed into the class structure. The four week time period is a critical component in achieving significant and lasting behavior change. The intent is also to establish lasting relationships between Leadership Academy participants in order to create an overall environment of peer support, coaching, and feedback. Ongoing leadership development activities are anticipated for Leadership Academy graduates.

The curriculum structure relies heavily on "strategies for high involvement leadership," a training program developed by Development Dimensions International (DDI). The training is founded in the use of the following key principles for management interaction:

Maintain or enhance self-esteem
Listen and respond with empathy
Ask for help and encourage involvement
Share thoughts, feelings, and rationale
Provide support without removing responsibility

The training builds on these principles to introduce both behavior and skill improvements. DDI programs and products are used extensively by the Nuclear Department and PP&L Corporate. The Candidate Assessment Program (CAP), targeted selection, performance appraisal dimensions, and the Synchrony 360 degree assessment program are all DDI based programs. This provides a common platform for integrating selection, performance improvement, leadership development and assessment activities. DDI also offers extensive "soft-side" management training, beyond the topics selected for Leadership Academy, which can be used for continual learning activities.

The format and content for the Leadership Academy as well as the overall philosophy is established and maintained by the Leadership Curriculum Committee. This committee is made up of the General Manager (Chairperson), Supervisor Nuclear Instruction (Vice-Chairperson), Engineering Manager, Manager — Nuclear Training, several Functional Unit Managers, Educational Advisors, and two Leadership Academy graduates. The committee

makes extensive use of feedback from each Leadership Academy in identifying program and format changes.

The Leadership Academy learning experience relies heavily on the interaction between class participants and instructors. The courses are structured through the use of videos, skill practices, and facilitated discussions to bring out department concerns and issues and have participants learn from each other. Wherever possible, department leaders are involved in presenting the course material along with their personal insights. Courses are also designed to emphasize Susquehanna specific experiences.

Leadership development teams

In 1997 Leadership Academy Teams were formed to sponsor each Leadership Academy. During 1997, these teams were certified to teach the DDI material which forms the basis for Leadership Academy. In addition to teaching certain classes, the intent is for the Leadership Development Team to establish on-going relationships with their designated class.

There are six leadership development teams within the nuclear department. These teams are made up of approximately six representatives from the Executive and Functional Unit Manager levels as well as a representative sample of second and third line supervisors having significant influence over department business areas. The objectives for these teams are:

(1) To establish interaction and feedback between executive and middle level department managers to support continual development and improvement in leadership skills and behavior s.

(2) To provide a platform for establishing a working vision for effective leadership and on-going leadership development activities.

(3) To provide a consistent model of leadership and behavior principles for the Nuclear Department and to communicate this model to all levels of department supervision through sponsorship of Leadership Academy classes.

The expectation is that these team members continually observe each other's behavior in meetings, work situations and in handling problems, and provide an on-going source of feedback and support to each manager's personal development. This team structure will provide an on-going platform for coaching, performance monitoring, and improvement.

Each of the six teams completed a one week course in strategic leadership skills. This course is a "train the trainer" activity designed to certify the participants to teach the DDI modules on Strategic Leadership for the Leadership Academy. Each Leadership Academy class taught after February was partnered with one of the Leadership Development Teams. This team provides the instruction in the DDI material and serves as mentors for the assigned Leadership Academy class. The exact role and the degree of before, during, and after interaction with the class is determined by the individual development teams. This participation may consist of:

(1) Meeting with the Leadership Academy class in advance, individually or as a group, to establish expectations and do class readiness assessments or preparation activities.

(2) Attending Leadership Academy Kickoff and introduction sessions which set the expectations for LA participants.

(3) Monitoring class progress and providing interventions as appropriate to maximize the learning experience for each participant.

(4) Participating in post-Leadership Academy follow-up activities.

The Nuclear Training Department provides tools, suggestions, or support for these initiatives. The Leadership Development Team provides clarity about expectations and outcomes early in the Leadership Academy.

1996 Activities

The pilot program for the Leadership Academy was completed in July. The second Leadership Academy was completed in November.

In 1996, there were a total of 31 graduates of the Leadership Academy.

1997 Activities

Leadership Academy III through Leadership Academy VIII were completed resulting in 91 graduates of the Leadership Academy.

Six Leadership Development Teams completed certification and sponsored five Leadership Academies in 1997.

1998 Activities

Leadership Academy IX through Leadership Academy XIII were completed during 1998.

The Leadership Academy Reunion was held at Split Rock Lodge in January of 1998.

1999 Activities

Five Leadership Academies, Leadership Academy XIV through Leadership Academy XVIII, are scheduled during 1999.

Leadership Academy curriculum

The following is a "typical" Leadership Academy schedule and course outline. functional unit manager and executive availability as well as other activities throughout the month may impact schedule and content.

Week 1

Day 1

Welcome (2 Hours)

The General Manager (George Kuczynski) provides the Leadership Academy Welcome and sets expectations and the framework for the Leadership Academy class. The Leadership Development Team participates in the opening session.

Overview

The format, structure, schedule, and logistics are presented. Class norms are also set. (Presenter — Leadership Academy Director)

Key principles for high involvement (5 1/2 Hours)

The DDI five Key Principles are introduced. These principles form the foundation for all Leadership Modules and set a model for leadership behavior . Through videos, exercises, and interactive discussions, participants become familiar with the Key Principles and how they relate to work at Susquehanna. (Presenter - Leadership Academy Director and Leadership Development Team)

Day 2

Leadership: Facilitating change

Describes how a changing work environment has transformed the traditional management role. It introduces four leadership roles:

(1) Leading through vision and values

(2) Championing continuous improvement

(3) Building partnerships

(4) Facilitating learning

The course reviews phases of change, helping the leader and others be more comfortable with change and establishing role clarity during times of change. This class sets the strategic foundation for more skill based training in later Leadership Academy classes. (Presenters — Leadership Development Team)

Day 3

Corporate finance (4 Hours)

A “down-to-earth” look at the PP&L financial picture as it relates to the company management, the employees, and the investor. Relates strategic business decision-making to key financial drivers. (Presenter — Line Manager)

Process mapping and analysis (4 Hours)

Provides some hands-on experience with preparing process maps, identifying stakeholders, activities, and process flow using the adopted process methodology and Susquehanna specific examples. (Presenter — Manager — Continuous Improvement)

Day 4

Nuclear department models

In this course selected Nuclear Department Models are presented with particular emphasis on application in workplace situations. Models include: Decision Making, SRA Change Management, and Communication. (Presenter — Line Manager).

Project introduction

As part of the Leadership Academy experience, the class is expected to complete a project working in a team environment. The project content and design is left to the participants with some underlying guidelines. Time is provided throughout the month to develop the project. (Presenters — Leadership Academy Director and Leadership Development Team).

Day 5

Assessment (1 Hour)

Introduces the services provided by Nuclear Assessment Services and the process for performing assessments at Susquehanna. (Presenter - Manager - Nuclear Assessment)

Observation training (5 1/2 Hours)

Instructs on observation skills necessary for supervisors to identify and correct work practice problems (unacceptable work practices, standards issues, and work environment issues). (Presenter — Training Supervisor)

Safety (1 Hour)

Discusses the first line supervisor's role in attaining and maintaining an accident free workplace. Discusses intervention strategies, leadership behavior s, and roles and responsibilities of the first line supervisor. (Presenter — Safety Department)

Week 2

Day 6

Conflict resolution (8 Hours)

Applies the Key Principles to the supervisors' role in guiding effective conflict resolution. Identifies root causes for conflict in the workplace and introduces a strategy for pre-planning conflict resolution discussions using "Interaction Guidelines" and "Key Principles." Uses video examples of effective and ineffective conflict resolution strategies. (Presenters - Leadership Development Team)

Day 7

Analyzing human performance (4 Hours)

Provides a simple straightforward methodology for identifying, assessing, understanding, and resolving performance discrepancies. The course is based on the book, *Analyzing Performance Problems*, by Robert Mager and Peter Pipe which is read by participants prior to the class. Exercises include Susquehanna specific examples. (Presenter - Manager — Nuclear Training)

Day 8

Insights on department and corporate strategies (4 Hours)

The Senior Vice-President Generation/Chief Nuclear Officer, Bob Byram, leads an interactive discussion which explores the evolution of PP&L's recent changes and strategy development. (Presenter — Senior Vice-President Generation/Chief Nuclear Officer)

Difficult communications (4 Hours)

Reviews strategies for dealing with difficult communication situations which a supervisor may face. Video, interactive discussions, and PP&L supervisors' policies are used to work through issues such as avoiding misunderstanding during pre-employment/selection interviews, delivering bad news with regard to performance appraisals or job status, communicating unpopular news to a group, and managing displacement or termination communications. An informational review of the PP&L outplacement services is also included. (Presenter — Line Manager)

Day 9

Organizational culture (8 hours)

Examines the defining criteria for organizational culture, basic assumptions and beliefs, and how culture is embedded and transmitted. This forms a platform for discussing principles for implementing and facilitating cultural change. Two examples of diverse but successful organizational cultures in other industries are studied and explored. (Class requires pre-work.) (Presenter — Line Manager)

Day 10

Teams: Reaching new heights (8 Hours)

Introduces team leadership strategies to ensure productive, effective team functions. Course assumes fundamental team management techniques and dynamics are understood. It focuses on more advanced skills of enhancing performance, re-energizing teams, recognizing common pitfalls, and leadership intervention strategies. (Presenters — Leadership Development Team)

Week 3

Day 11

Coaching: Developing high performance (8 Hours)

This session builds on the Key Principles, Interaction Guidelines, and introduces the concept of pre-establishing expectations through the use of "checkpoints" to enhance coaching skills. This module covers creating an environment receptive to effective coaching,

enhancing coaching skills, and customizing coaching. Learning is facilitated through positive video models and participant skill practices. (Presenters — Leadership Development Team)

Day 12

Nuclear department strategies (4 Hours)

The Vice-President Nuclear Operations, George Jones, meets with the Leadership Academy in an interactive discussion on the development and course of the Nuclear Department Strategic Direction. (Presenter — Vice-President Nuclear Operations)

Project Time: Time is allocated periodically throughout the Leadership Academy schedule for the teams to work on their class project.

Day 13

Civil treatment for managers

This course is taught by an attorney with experience in defending corporations in civil cases brought by employees. The course provides five prescriptive rules or guidelines to help supervisors act fairly and legally. Actual cases are reviewed from a lessons learned standpoint. Some legal information is provided, but emphasis is on conduct and behavior s designed to preclude problems. Focus is on the workplace environment established, including AA/EEO considerations. (Presenter — Employment Learning Innovations (ELI))

Day 14

Just cause: Managing human performance

Covers some of the legal and practical aspects of the employee/employer relationship. Includes the genesis of the “Just Cause” concept and its relationship to how we set policy and manage employees. The tests for just cause, discussion of the concept of “reasonableness,” and the clash between person rights and business needs. Learning experience includes lecture, discussion, and case studies. (Presenter — Line Manager)

Day 15

Adapting to change

Combines the key principles, interaction guidelines, and effective feedback techniques to provide the supervisor with a better understanding of the dynamics of change and equips him for his role as a catalyst for change. Explores issues such as managing situations in the absence of information, avoiding over-commitment, recognizing and managing resistance to change at the group and individual level. (Presenters — Leadership Development Team)

Week 4

The last week of Leadership Academy is conducted offsite. This affords a more concentrated environment for team interaction and allows for evening sessions for project work and strengthening the team experience. Feedback from Leadership Academy graduates reinforces the value of conducting this final week at an offsite location.

Day 16

Partnerships (8 Hours)

Examines the various partnerships within the workplace. Introduces the concept of partnership between internal and external partners. Explores the importance of establishing a shared vision, gaining commitment, and establishing shared responsibility to make partnerships work. Looks at establishing and maintaining partnerships as well as handling difficult partnership situations. (Presenters — Leadership Development Team)

Day 17

Labor relations (4 Hours)

PP&L Corporate HR&D course to provide a basic understanding of our Labor Relations issues, the management/bargaining unit relationship, the labor agreement, and the supervisor's role in the bargaining unit relationship. (Presenter — HR&D/Labor Relations)

Day 18

Time management (8 Hours)

This is the Franklin Planner course for personal time management. It focuses on the importance of establishing and maintaining personal values and goals and managing daily activities to meet short term and long term goals. Franklin Planner time management system is provided (Presenter — Franklin Covey, Inc.)

Day 19

Trust: Strengthening the foundation (8 Hours)

Examines the trust level in the environment including warning signs of low trust, explores common trust traps, and how unintentional actions can erode the trust within groups. Identifies five strategies for building trust. Course relies heavily on participant discussion and interaction. It is most effective when facilitated by a Functional Unit Manager. (Presenters - Leadership Development Team)

Day 20

Leadership Academy feedback and project presentations (4 Hours)

The last day of Leadership Academy is a joint session with the Leadership Academy class and the sponsoring Functional Unit Managers. The class provides feedback on the Leadership Academy experience from a curriculum improvement as well as a personal viewpoint. The project results are presented by the team. A graduation lunch follows the morning session. (Facilitator - Leadership Academy Director)

Leadership Academy summary

The single most significant issue facing the nuclear industry is the ability to maintain excellence in safety and operations while producing electricity at a market competitive price. Development of leadership qualities within the workforce and enhancing individual ownership and accountability for excellence in performance is essential to a viable nuclear industry. PP&L is addressing this issue through an intensive management and supervisory development program entitled, "Leadership Academy."

The intent of the Leadership Academy is to provide supervisors with an intensive exposure to key leadership principles, theory, and tactics to allow them to meet the challenges of workforce management in an environment of change and competition while maintaining a strong and conservative nuclear safety culture. Eight Leadership Academy classes have been run to date.

The curriculum combines strategic leadership principles with tactical skill instruction to enhance existing supervisory skills and to develop new skills such as change management, coaching, building partnerships, process mapping, and leading cultural change. The program also provides an opportunity to interact with nuclear department executives and functional unit managers to understand not only the department direction, but the logic, rationale, and external factors which influence our current business plan.

Leadership Academy is conducted full time over a four week period. An academy class contains approximately 15 students. A mix of first and second line supervisors, engineering and craft supervision, site and general office participants, and a cross-functional representation is designed into the class structure. The four week time period is a critical component in achieving significant and lasting behavior change. The intent is also to establish lasting relationships between Leadership Academy attendees in order to create an overall environment of peer support, coaching, and feedback. In addition to formal instruction and outside study, the Leadership Academy class is expected to complete a class project which enforces the concepts learned, builds teamwork within the class, and has significant business value to the organization.

The format and content for the Leadership Academy, as well as the overall philosophy, is established and maintained by the Leadership Curriculum Committee. This committee is made up of the General Manager (Chairperson), Supervisor Nuclear Instruction (Vice Chairperson), Engineering Manager, Manager - Nuclear Training, several Functional Unit Managers, Educational Advisors, and two Leadership Academy graduates. The committee makes extensive use of feedback from the Leadership Academies in identifying program and format changes.

The Leadership Academy learning experience relies on the interaction between class participants and instructors. The courses are structured through the use of videos, skill practices, and facilitated discussions to bring out department concerns and issues and have participants learn from each other. Wherever possible department leaders are involved in presenting the course material along with their personal insights. Courses are also designed to emphasize and relate to Susquehanna specific experiences.

Letter to Leadership Academy members from plant manager

Congratulations! You have been selected by your functional manager to attend the Nuclear Department Leadership Academy. Your participation in this program is a full time, high priority assignment which will extend from June 15, 1998, through July 10, 1998.

The Leadership Academy program consists of training focused on leadership, business, and human performance. The program content is designed to enhance and broaden the Nuclear Department's ability to balance its business, interpersonal, and technical aspects by improving leadership within the Department. The Leadership Academy supports our Nuclear Department Direction for 1998 and is a Key Action for improving leadership behavior s and management practices.

Between now and the first day of the Leadership Academy, you will receive additional information and materials from Marcia McGann, the Director of the Leadership Academy. Contact her at x-3864 or by MS mail if you have questions that require an immediate response.

Annex F

PP&L/USA — MAINTENANCE PERSONNEL TRAINING

Improving human performance of maintenance personnel at the PP&L Susquehanna steam electric station

This annex describes the systematic approach to training used to implement improvements in human performance of maintenance personnel at Pennsylvania Power and Light, Inc.'s Susquehanna Steam Electric Station. The sponsor for this improvement activity was the maintenance manager. The intervention was made due to an increased number of human performance errors. The human performance errors were in the use of procedures and work plans, and in the completion of data sheets and action taken section of the work authorization documents. The action taken section is where the completed work is documented. The systematic approach to training process used for this intervention followed the five step Training System Development model of analysis, design, development, implementation, and evaluation.

Analysis — The first step in determining the best intervention is analysis. A needs analysis was conducted by line supervision and training personnel based on internal event reports, maintenance department self-assessment data, internal audits reports, Nuclear Regulatory Commission inspection reports, and Institute of Nuclear Power Operations evaluation reports. The decision made as a result of the needs analysis was that training should be used as the intervention to improve the performance of the maintenance department. The intervention needed to focus on expectations for the use of work documents, actions during the conduct of work, and proper documentation of the work that was performed.

The decision to conduct training initiated a review of the current job analysis for the electrical, instrumentation and controls, and mechanical maintenance work groups to determine the type of tasks that they perform. The knowledge and skills needed by each work group to perform those tasks were reviewed. These knowledge and skills were the bases for the content of the training intervention. These analyses were completed by the second line supervisors and trainers. The results of the analyses were used in the design phase of the training system development model.

Design — The design of the training intervention was completed by the maintenance second line supervisors and trainers based on the analyzes and the expectations of the Manager-Nuclear Maintenance. The result was to develop a 16 hour classroom and laboratory presentation that integrated the maintenance standards, station procedures, and job activities using standard maintenance work packages for each discipline. The design of the training material was to have three primary areas of focus. The first area was an introduction by maintenance management to describe the purpose of the training; the second area was a review of procedure requirements, self-checking, verbal communication, and documentation; the third area was the application during the performance of simulated work activities.

The delivery method was determined to be facilitated learning conducted by the trainer and first line supervisors. Successful completion criteria were based on a practical examination using the desired human performance behavior s during the performance of simulated work activities using standard work packages. The students for this course were all the incumbent maintenance personnel.

Development — The next step, development, used the outline and objectives developed in the design phase. The development was completed by maintenance trainers with input from maintenance management. The development of the training material used the station procedures that defined maintenance activities and expectations, the written maintenance standards, and work packages developed by the maintenance work planning group. The work packages developed included typical errors that had been discovered during self-assessment.

The course titled the Human Performance "Tool Bag" introduced the expectations for work performance. The Human Performance "Tool Bag" included expectations for: self-checking, at-risk compensation, concentration on the job, communications, procedure and data sheet use, documentation requirements, and questioning attitude.

⇒ Self-checking
- (A) All personnel must apply self-checking to each assigned task.
- (B) A conspicuous hesitation must be exhibited prior to significant activities or actions.

⇒ At-risk compensation
- (C) Workers are to use additional precautions to off-set or mitigate physical or environmental conditions, for example; high voltage, high radiation, poor lighting, extreme heat, personal fatigue, etc.
- (D) All personnel are to evaluate risks associated with first-time performance, complacency with monotonous tasks, etc.
- (E) The known risks are to be discussed at the pre-job tailboard.

⇒ Concentrate on the job activity
- (F) Workers are to eliminate non-job related talking during critical job steps.
- (G) Everyone needs to minimize distractions during work.
- (H) Workers are to maintain a focus on the job task being done.

⇒ Communication
- (I) Everyone uses three part communications for all critical job steps or actions.
- (J) Work group communications should be clear, concise, consistent, and continuous during the job.

⇒ Procedure and data sheet use
- (K) The work crew should review the paper work prior to heading out to the job.
- (L) Workers conspicuously and frequently use procedures and work packages as the job progresses.
- (M) The work plans shall be used and data sheets are used to support the work package.

⇒ Documentation requirements
- (N) The documentation shall be clear, concise, accurate, and legible.
- (O) The documentation shall reconcile the problem description, scope, and post maintenance testing.
- (P) The documentation shall reflect the true activities performed.
- (Q) The data sheets and status control documentation should be completed at the time the action is taken.

⇒ Questioning attitude
- (R) The crew members question each other at pre-job tailboards.
- (S) Everyone is to provide feedback for improvements to management.

The length of the developed course was 16 hours. The use of the work packages with errors allowed the students to apply the Human Performance "Tool Bag" expectations which

reinforced retention and increased the probability of the transfer of training to the work location.

The course was pilot taught to maintenance second line supervisors. The comments from the pilot session were incorporated into the material. The training material was then reviewed and approved by the second line supervisors for all discipline of the maintenance line organization.

Implementation — The implementation phase includes teaching the course and evaluating the students. The training course was taught to the first and second line supervisors by the trainers. The supervisors evaluated the course content and provided feedback to the trainers. The course was modified to incorporate the comments from the supervisors.

The course was then taught to all electrical, instrument and controls, and mechanical maintenance personnel on site. This included approximately 400 maintenance personnel and approximately 100 Mobile Work Force personnel that are assigned to the plant. The Mobile Work Force personnel are company maintenance personnel that travel throughout PP&L's system performing work at all the power plants. Some Mobile Work Force personnel are home based at different locations throughout the PP&L system. These courses were taught by the first line supervisors and trainers to the first line supervisor's work crew. The second line supervisors introduced the course and attended each course for their discipline's crews. The evaluation of the students was performed by line supervisors and trainers using predetermined skills, knowledge, and Human Performance "Tool Bag" criteria.

Evaluation — The evaluation phase of the Training System Development model feedback into all previous phases. Therefore, evaluation is continuous. Evaluations were through: preparation and teaching, student critiques, and feedback from self-assessment, internal audits, Nuclear Regulatory Commission reports, and Institute of Nuclear Power Operation reports. The feedback from the supervisors and students was used to make changes as appropriate while the course was taught.

A need was identified that all new personnel would need to be trained. This meant all contractor personnel and Mobile Work Force personnel, that support the plant during outages and other peak work, would need to be trained in a similar course. The new course is one day in length and is taught by training personnel to all new personnel supporting maintenance.

The Human Performance "Tool Bag" criteria have been added to the training curriculum for all maintenance groups. The "Tool Bag" criteria have been added to all laboratory and on-the-job training. All skills training and qualifications use human performance, knowledge, and skills criteria for determining satisfactory completion. Therefore, a person can possess the skill but could fail because they did not apply the human performance criteria.

The evaluations performed by maintenance, Nuclear Regulatory Commission, and Institute of Nuclear Power Operations indicate that the intervention has been successful at reducing human performance errors. Although there are still errors made, the reduction in the errors indicates that the intervention developed, using the systematic approach to training's Training System Development model, has been successful.

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Annex G

INSP/DOE/USA TRAINING ASSISTANCE TO SOVIET-DESIGNED REACTOR SITES

Background

The U.S. Department of Energy has been conducting activities related to improving the training of nuclear power plant (NPP) personnel at Soviet-Designed Reactors (SDRs) since September 1992. The initial focus of this work was on the development of national training centers within both Russia and Ukraine, but has since expanded to encompass training program development activities at all Russian and Ukrainian NPPs and training centers, as well as at SDRs within other countries. Where possible, the U.S. has combined efforts with the International Atomic Energy Agency (IAEA) to conduct coordinated training development activities, especially in Lithuania and Armenia.

The primary area of activity in the training development work is the transfer of the Systematic Approach to Training (SAT) methodology through the analysis, development, implementation and evaluation of pilot training programs for technical positions within the plant, primarily in operations and maintenance. However, it wasn't long into the project, when the identification of training needs for management and supervisory skills training was discussed. Many of the topics identified, fit into the definition of "soft skills" training.

Need

As work progressed on the development of pilot training programs for technical positions at the NPPs, several of the needs analyses conducted for the development of each course identified what we would describe as management and supervisory skills. Training of these skills was not covered by the technical portion of the pilot programme. Examples included, communication and teamwork skills for the Shift Supervisor and for the Control Room Operators; performance evaluation and oversight skills for Simulator Instructors and Supervisors across all departments; and decision-making and planning/organizing skills for managers in operations and maintenance departments.

In addition, while training materials existed for technical training programs, no materials could be identified within these countries for the management and supervisory skills training. In the effort to enhance operational safety and safety culture, in general, at the Soviet-Designed Reactors, it became obvious that some work would have to be done in the training of "soft skills".

Approach

A training workshop entitled, Concepts in Management, was developed initially for use at the Balakovo NPP in Russia. Developed and presented by U.S. specialists, it was reviewed and evaluated by our Russian colleagues and 'russified' where appropriate. It has subsequently been adapted and modified for use at the Kozloduy NPP in Bulgaria, and the Khemlnytskyy, Chernobyl and Zaporozshe NPPs in Ukraine. In each case however, the first implementation of the workshop has been presented by U.S. specialists. In the next phase of implementation, it will be jointly conducted by in-country and U.S. specialists, with the expectation that it can

be totally transferred to in-country specialists shortly thereafter. It is a workshop that provides an overview of basic management skills, with a particular emphasis on “soft skills”. While the workshop may be employed to cover general management techniques, each specific management concept may be discussed and presented in the context of its use and application by managers in a specific industry or organization. The latter is achieved by implementing an “express analysis” of the needs, strengths, and problems of the managers for whom the workshop is being conducted.

The analysis can be conducted in several ways including a limited number of interviews and discussion groups and the use of a standardized organizational culture survey. The survey technique was employed at two of the stations in which the workshop has been conducted. The results of the survey provide a statistically significant sample of employees’ attitudes and opinions on many of the topics covered in the workshop. The workshop content is then tailored in accordance with the results of the “express analysis” so as to achieve maximum impact of manager performance. Site specific data is presented to the managers to provide the best and clearest examples of their own good and/or bad management practices.

Methodology

The initial workshop content was based upon an analysis of management jobs and tasks which resulted in the following 10 tasks being defined as the primary responsibilities of NPP managers:

(1) Exhibit leadership and motivate subordinates to achieve high levels of professionalism and performance.

(2) Establish organization mission, performance objectives, and performance standards.

(3) Monitor and direct station, unit, or department activities to ensure that the station is operated, maintained, and tested consistently with high standards of operational safety, reliability, and efficiency and in accordance with technical specifications, applicable standards, and regulatory requirements.

(4) Ensure that daily operations reflect the organization’s values and goals.

(5) Analyze organizational performance and implement continuous improvement programs.

(6) Solicit advice and work with subordinates, assurance groups, and other departments to solve technical and financial problems and to develop effective improvement programs.

(7) Maintain an adequate number of qualified personnel on the station or department staff.

(8) Conduct public relations matters and disseminate information in accordance with corporate policy.

(9) Coordinate station, unit, and department activities with regulatory and other external organizations.

(10) Manage the station, units, and departments in accordance with established budgets.

Subsequently, the following management skills and knowledge were identified as the key competencies required by NPP managers to perform their jobs and carry out their responsibilities at the highest levels:

(1) Leading
(2) Organizing
(3) Decision making
(4) Communicating
(5) Motivating
(6) Managing groups/teamwork
(7) Planning
(8) Controlling
(9) Evaluating
(10) Quality management
(11) Human factors

The Concepts in Management workshop is organized around these manager competencies. The specific competencies to be addressed in the workshop are defined by the needs of the organization. The length of the workshop also may vary, depending on the number of topics included and the depth of coverage of each topic. Workshop activities for each topic include discussions and individual and group exercises.

Content

The modules used to date at several of the SDR sites are identified below, with the learning objectives for each module.

Module 1: Introduction to management

Learning objectives:
(1) Be able to define management.
(2) Given the skills and knowledge requirements of managers, be able to discuss how they apply to your management function within the organization.
(3) Given a variety of historical management approaches, be able to define the basic approaches.

Module 2: Organizing

Learning objectives:

(1) To realize the importance of developing and maintaining an efficient, dynamic organization.
(2) To learn the advantages and disadvantages of the division of labor.
(3) To realize the influence of span of control on the organizational hierarchy and on overhead costs.
(4) To understand the differences among the concepts of authority, responsibility, accountability, and power.
(5) To understand the advantages and disadvantages of delegation of authority.

(6) To realize that the informal organization is a fact of life, but not necessarily anti-management.
(7) To learn techniques on how to increase the ability of the organization to deal with change.
(8) To understand organization development principles and techniques.

Module 3: Communicating

Learning objectives:

(1) To define the elements of effective communication.
(2) To describe ways in which barriers to communication can be overcome.
(3) To identify ways in which communications can be improved.
(4) To describe types of communications that representative of the downward, upward, and lateral formal communications systems that exist in an organization.

Module 4: Motivating

Learning objectives:

(1) To understand how people are motivated.
(2) To realize that motivational factors are complex, personal, and changeable.
(3) To recognize human needs and the role they play in motivation.
(4) To become familiar with theories and professional explanations of human behavior.
(5) To be able to apply motivational techniques where you work.
(6) To understand concepts of job satisfaction and morale and their impact on motivation.

Module 5: Decision making

Learning objectives:

(1) Describe the types of decisions that exist and discuss the strategy that is most effective in dealing with each type.
(2) Identify the variables that are important to think about in deciding whether or not to delegate a decision.
(3) Discuss the basic decision making model.
(4) Describe some pros and cons of using an individual as opposed to a group to make a decision.
(5) Identify two types of quantitative decision tools that exist and discuss the types of decisions which would be appropriate to make with each.

Module 6: Managing groups

Learning objectives:

(1) Identify advantages and disadvantages of using groups.
(2) Identify different types of groups that exist in organizations.
(3) List and define characteristics of groups.
(4) Describe stages of group development.
(5) Discuss ways potentially negative influences on group behavior can be mitigated.

Module 7: Quality management

Learning objectives:

(1) To understand the concept and basic principles of quality management.
(2) To learn how to increase employee participation in quality management.
(3) To understand the value and quality and use of quality tools.
(4) To learn how to implement quality management principles and practices to improve processes and performance.

Module 8: Human factors engineering

Learning objectives:

(1) To describe the basic principles of human factors engineering.
(2) To identify why human factors engineering is important in plant operations.
(3) To consider how human factors engineering can be applied in specific contexts.

Results and lessons learned

Feedback from the various implementations of the workshop has generally been favorable. Observations from participants worth noting and fairly generic across NPPs include:

* The workshop presents a good introductory overview to these concepts in management; for some groups it might be better to have a more advanced course.
* The use of examples and exercises is very good; some exercises could be more relevant to in-country applications.
* There is too much material for only a 2–3 day workshop; increase the length of the course or reduce the material.
* Complete the modules for the entire list of competencies; leading, evaluating, controlling and planning.
* Present the workshop away from the plant (work environment); too many distractions; difficult to stay focussed.

Several lessons have been learned from the implementations conducted to date:

* Conduct the workshop at a remote location away from the work environment; this results in better discussion among participants and less distractions; when held at a location where participants must stay overnight, even better interactions and group exercises result (this was done twice and worked quite well).
* Additional modules, specifically leadership and planning are under development; they will be implemented with the rest of the modules at the next workshop to be conducted.
* More extensive review will be provided by the in-country specialists prior to implementation to improve the relevance of group exercises and examples;
* Evaluation of behavior s should be avoided; for example, some types of communication processes work better in one culture than another.
* Use of the survey results can provide organization specific examples to work with within the course; survey results also provide cultural profiles which can help in effective implementation of the material.

Annex H

PP&L/USA NUCLEAR DEPARTMENT NEW SUPERVISOR TRAINING PROGRAM

The need for supervisor training has been identified based on preparing new supervisors to perform their new duties in an efficient and effective manner. The program has been designed to incorporate the needs of the company, the nuclear department, and the individuals.

Introduction

The Nuclear Department's supervisor training program is designed to provide new supervisors with the training necessary to successfully transition from individual contributor into the role of leader of others. New supervisors are required to attend selected training courses and predetermined job familiarization visits prior to supervising independently. The remainder of the training, job familiarization visits, and required reading must be completed within one year of assignment to the program.

The format and content for the supervisor training program as well as the overall philosophy is established and maintained by the Leadership Curriculum Committee. This committee is made up of the Vice President-Nuclear Engineering and Support (Chairperson), Supervisor-Nuclear Instruction (Vice-Chairperson), three Functional Unit Managers, three second line supervisors, three first line supervisors, the Manager HR-Nuclear, and the Leadership Academy Director. The committee makes use of feedback from student critiques and follow-up feedback from supervisors that complete the program to identify program changes.

Training — The training courses provide training on fundamental leadership and supervisory skills, and the appropriate administrative programs and processes necessary for a supervisor to be an effective member of management at a nuclear power plant. The program also provides an opportunity to interact with Functional Unit Managers and plant supervisors to understand not only the department direction, but the logic, rationale, and external factors that influence our current programs and processes.

The supervisor training program courses take approximately four weeks to complete. The four-week program is scheduled in one-week modules separated by one or more weeks. This scheduling allows the new supervisor to begin applying the newly learned material immediately on the job. The students attending the courses are typically from different work groups. This allows the new supervisors to establish lasting relationships between participants to create lasting partnerships in the department.

The curriculum is based on the supervisor dimensions that are used in the selection process and the dimensions that are part of the performance appraisal process. The training material for the supervisory dimensions is primarily from the Interaction Management: Tactics series developed by Development Dimensions International (DDI). The DDI training is based on five key principles:

Maintain or enhance self-esteem
Listen and respond with empathy
Ask for help and encourage involvement
Share thoughts, feelings, and rationale
Provide support without removing responsibility

The key principles form the foundation for expected management behavior's. The training builds on these principles to develop both behavior and improve interaction skills. DDI programs and products are used extensively by the Nuclear Department and PPL, Inc. The Candidate Assessment Program (CAP), Targeted Selection Interviews, and performance appraisal system use the DDI dimensions as their foundation. This provides a common platform for integrating selection, performance improvement, leadership development, and assessment activities.

The supervisor training programme also teaches communications, functions and responsibilities of the major work groups, root cause analysis, codes and standards, corporate required training i.e. sexual harassment, Standards of Conduct and Integrity, and the positive discipline program.

The supervisor training program learning experience relies heavily on the interaction between class participants and instructors. The courses are designed to use videos, skill practices, and facilitated discussions to learn the knowledge and skills to be successful as supervisors. This interaction uses department examples as appropriate to understand concerns and issues within the department. This allows the participants to learn from each other as well as the facilitator. Whenever possible, department leaders are involved in presenting the course material along with their personal insights.

The supervisor training program sequence of courses is typically based on conducting New Supervisor Orientation, Safety and the First Line Supervisor, and Core Skills for Building Commitment, respectively. The remainder of the courses can be scheduled in any sequence.

Job familiarization visits — The supervisor training program includes Job Familiarization visits. These visits allow the new supervisors to meet with individuals from work groups that they interface with and determine what help they can provide and what the other work groups need from them.

Required reading — There is also a required reading list that helps the supervisors locate and review the numerous policies and procedures that will help them perform their job. This section is not intended to have the new supervisors memorize these policies, rather it is intended for the new supervisor to be familiar with them and know where to find them when needed.

The results of the program have been evaluated during follow-up interviews with the supervisors that have completed the program. The new supervisors reported that the program was very useful in preparing them for their new job. The supervisors also recommended a course be added on teamwork. This course will be added during the next revision. The new supervisors also indicated that the job familiarization was of extreme value as was the policies in the required reading list. The feedback indicated that the one week module schedule was beneficial since it allowed the supervisors to schedule training around their other work responsibilities.

Week 1

Day 1

New supervisor orientation (MA056) — 4 Hours

The roles, responsibilities, and accountabilities of being a supervisor are introduced. The intent of this course is to help the new supervisor transition from being an individual contributor to a leader of others. (Presenter — senior department manager or professional trainer.)

Safety and the first line supervisor (PQS042) — 4 Hours

The responsibilities of the first line supervisor for communicating, enforcing, reinforcing, and correcting safe behavior s are discussed. This course is one of the foundation courses for the new supervisor. (Presenter — Nuclear Department Safety Group)

Day 2

Core skills for building commitment (CPI003) — 8 Hours

The DDI five key principles are introduced in this course. These principles form the foundation for all Supervisor soft-skills modules and are the bases for expected leadership behavior in the Nuclear Department. Through videos, exercises, and interactive discussions, participants become familiar with the key principles and how they relate to work at Susquehanna. (Presenter — DDI certified instructor)

Day 3

Radiological protection (MA062) — 4 Hours

This course provides an overview of supervisor responsibilities and methods to improve radiological work performance for those supervisors that have workers that enter the radiological controlled area. It is intended to improve communications and teamwork between the work group supervisors and Health Physics. (Presenter – Health Physics Personnel)

QA indoctrination and training (NQ001) — 4 Hours

This course provides an overview of the Quality Assurance (QA) and Quality Control (QC) programs. It stresses the importance of implementing these programs in carrying out the responsibilities of each work function at a nuclear power plant. (Presenter — Nuclear Assurance personnel)

Day 4

Observation training (MA042) — 4 Hours

This course teaches, then practices, the observation skills necessary for supervisors to perform critical observations of work, training, and task performance evaluations. These skills allow the supervisor to identify strengths to reinforce and areas for improvement. The focus is work practices, standards, and work environment issues. (Presenter — Training Supervisor)

Procedure/work package preparation, use, and control (MA059) — 4 Hours

This course reviews the preparation and use of the work documents used at SSES. It discusses the fundamental considerations involved in applying and controlling work at a nuclear power plant. (Presenters — Planning Supervision)

Day 5

Deficiency control (MA057) or deficiency identification and corrective action management (EG117) — 4 Hours

The purpose of this course is to describe the Nuclear Department processes for deficiency identification, evaluation, and corrective action management. (Presenter — Operating Experience Services Personnel)

Performance improvement (MA058) — 4 Hours

This course addresses the use of goals, objectives, monitoring, and self-assessment of work practices that contribute to the continuous improvement to move towards excellence. (Presenter — Line Supervisor)

Week 2

Day 6

Leadership: Inspiring commitment (CPI051) — 8 Hours

Applies the Key Principles and Interaction Process to help new supervisors be more effective when leading others. The course discusses the effects of change, essentials of success, and the characteristics of high-performing leaders. The course uses videotaped scenarios and small group learning activities to allow them to practice effective methods to improve their leadership skills. (Presenter — DDI certified Instructor)

Day 7

Nuclear personnel training and qualification (MA063) — 4 Hours

The systematic approach to training is presented in this course. The role of the supervisors in carrying out their training responsibilities is covered in detail. The focus of the learning is based on SSES' application of the systematic approach to training. (Presenter — Training Supervisor)

Conduct of plant operations (MA064) — 4 Hours

This course provides supervisors with a practical discussion of the operating concerns of SSES. The course will include 10 CFR 50, the Safety Analysis Report, Technical Specifications, and other important regulations. (Presenter — Operations Supervisor)

Day 8

Guiding conflict resolution (CPI039) — 8 Hours

Applies the key principles to the supervisors' role in guiding effective conflict resolution. Identifies root causes for conflict in the workplace and introduces a strategy for pre-planning conflict resolution discussions using "interaction guidelines" and "key principles." Uses video examples of effective and ineffective conflict resolution strategies. (Presenter — DDI Certified Instructor)

Day 9

Nuclear codes and standards (MA067) — 8 Hours

This course provides an overview of the codes, standards, and regulations required to maintain day-to-day operation of a nuclear power plant. (Presenter — Engineer Trainer or Engineer)

Day 10

Helping others adapt to change (MA037) — 8 Hours

Combines the key principles, interaction guidelines, and effective feedback techniques to provide supervisors with a better understanding of the dynamics of change and equips them for their role as a catalyst for change. Explores issues such as managing situations in the absence of information, avoiding over-commitment, and recognizing and managing resistance to change at the group and individual level.

(Presenter — DDI Certified Instructor)

Week 3

Day 11

Delegating for productivity and growth (CPI038) — 8 Hours

This course equips new supervisors to become catalysts who transfer meaningful responsibility and authority to others in a way that stretches people to improve their performance and abilities. (Presenter — Certified DDI Instructor)

Day 12 and 13

Technical writing (MA055) — 16 Hours

This course is designed to improve interpersonal and written communication skills. It uses proven techniques to help new supervisors sharpen their writing, speaking, and presentation skills. (Presenter — Training or Communication Personnel)

Day 14

Problem analysis and decision making (CPI047) — 8 Hours

This course provides new supervisors with the tools to analyze problems and make decisions. It includes the decision making model used in the Nuclear Department. (Presenter — DDI Certified Instructor)

Day 15

Nuclear safety concerns program (MA073) — 4 Hours

The procedures that describe the Nuclear Safety Concerns of Individuals program and Investigation of Alleged Retaliation for Raising Concerns are covered in this course. (Presenter — Training Supervisor)

Emergency plan overview (EP001) — 2 Hours

This course introduces new supervisors to the SSES nuclear emergency plan. It focuses on the procedures and the operations of the Nuclear Emergency Response Organization (NERO). (Presenter — Professional Trainer or Self-Study)

In-plant team management (EP054) — 2 Hours

This course provides the supervisor with an understanding of the nuclear emergency plan emergency organization. It also provides guidance for employees participating as member of the in-plant teams. (Presenter — Professional Trainer)

Week 4

Day 16

Root cause analysis for supervisors (MA075) — 8 Hours

This course introduces and develops a set of skills intended to facilitate the process of determining root causes and corrective actions. (Presenters — Engineer Trainers or Experienced Root Cause Evaluators)

Day 17

Contracts management (MA068) — 4 Hours

The control of contracts at SSES is the focus of this course. The new supervisors are provided information to ensure a basic understanding of the SSES contract policies and controls. It also includes the administration of contracts and management of contract requirements. (Presenters — Line Supervisor and Nuclear Procurement Personnel)

Plant chemistry (MA061) — 4 Hours

This course stresses the SSES Chemistry program and the importance of maintaining good quality water at SSES. It focuses on the supervisors' role in enforcing good work practices to minimize the impact on water quality as a result of plant work. (Presenter — Plant Chemistry Personnel)

Day 18

On-site/Off-site technical support (MA065) — 4 Hours

This course familiarizes the new supervisors with support that is available from both on-site and off-site technical organizations. (Presenter — Engineering Personnel)

Standards of conduct and integrity (PQS079) — 4 Hours

This course provides new supervisors with a review of the company's Standards of Conduct and Integrity. The intent is to reinforce the expectations of employee conduct in a competitive business environment. (Presenter — Professional Trainer)

Day 19

Just cause (MA119) — 4 Hours

Covers some of the legal and practical aspects of the employee/employer relationship. Includes the genesis of the "just cause" concept and its relationship to how we set policy and manage employees. The tests for just cause, discussion of the concept of "reasonableness," and the clash between personal rights and business needs. Learning experiences include lecture, discussion, and case studies. (Presenter — Line Manager)

Responsible behavior program (M00302) — 2 Hours

This is the company's positive behavior modification program. This course covers the supervisors' role in implementing the program and fundamental steps in the program. (Presenter — HRD or Training Supervisor)

Labor relations (M00440) — 2 Hours

PPL, Inc. Corporate HR&D course to provide a basic understanding of our Labor Relations issues, the management/bargaining unit relationship, the labor agreement, and the supervisor's role in the bargaining unit relationship. (Presenter — HR&D/Labor Relations)

Day 20

Plant security and non-radiological emergency (MA070) — 4 Hours

This training provides an overview of plant security and non-radiological emergencies for new supervisors. It covers the security plan and the fire codes and standards. (Presenters — Nuclear Security and Fire Protection Personnel)

Document control and storage (MA069) — 4 Hours

The purpose of this course is to provide supervisors with fundamental knowledge to ensure the documentation under their control is adequately controlled. (Presenter — Nuclear Records Personnel)

Week 5

Day 21

Planning and critical path method (CPI052) — 8 Hours

This course is designed to help new supervisors learn planning skills. The focus is how to use planning effectively to influence events and conditions. (Presenter — DDI Certified Instructor)

Day 22

Recognizing and preventing sexual harassment (MA126) — 4 Hours

The company's policy on sexual harassment is covered in this course. The supervisors are also made aware of the effects of sexual harassment in the workplace, the behavior's or actions that constitute sexual harassment, and their responsibility for preventing it. (Presenter — Training Supervisor)

Non-supervisory performance reviews (M00885) — 4 Hours

This course introduces the supervisors to the Bargaining Unit performance appraisal form and the basics of writing effective performance appraisals. (Presenter — HRD or Training Supervisor)

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Annex I

KANUPP OPERATIONS PERSONNEL TRAINING

Improving human performance of operations personnel at Kanupp

INTRODUCTION

Until 1989, KANUPP operations team consisted of five shift crews and an in-plant training center. The crews used to rotate in following shift duties:

(1)	Morning shift	8 a.m. to 4 p.m.
(2)	Evening shift	4 p.m. to 12 midnight
(3)	Night shift	12 midnight to 8 a.m.
(4)	Rest	complete day off
(5)	Supernumerary	on call or standby duty

While following the above system of shifts with the five shift crews, there was hardly any time for shift personnel to undergo training or re-training. If by some manipulation, a group of shift personnel would be taken out of shift to report to the In-Plant Training Center for training or re-training assignment, there used to be hardly sufficient time to train these personnel in the technical competencies required to run the plant smoothly and safely. Training in human performance competencies was not possible due to short time available for training. Also there was no systematic way to train these personnel in human performance related competencies. In fact KANUPP could not develop any methodology or technique for building these competencies in its personnel. No document on soft skill development was available. Even the awareness regarding the importance of soft skills was not there. Due to limited number of personnel in each of the five shift crews, shift supervisors would resist when personnel from their crews were taken out of shift duty for training purpose. There were instances where personnel continued working in a particular shift crew for many years without having an opportunity to work in general duty and without having an opportunity to come in contact with outside world. (Those who work in shifts can appreciate that “shift duty” is another world). These shift personnel had worked in the same crew, with the same colleagues, same subordinates and same supervisors for years. They had not opportunity to talk to higher management of the plant. The situation continued till 1989.

Problem

Due to the isolated environment of operation shift as mentioned above and absence of a soft skill training program, KANUPP had been facing many operational problems. Due to this reason some of the important soft skills could not be fully developed in operation personnel. Every time a problem was faced, it was attributed to the lack of training. Whenever it was said that it was due to lack of training it always implied lack of training in technical or hard competencies. It was never thought that the problem lies somewhere else;-most of the time it was due to lack of human performance competencies.

APPROACH TO PROBLEM RESOLUTION

Like many other operating organizations, KANUPP also decided to benefit from the in-depth experience of various IAEA teams. In 1988 Pakistan Atomic Energy Commission officially requested the Agency for an OSART mission to look KANUPP operational safety issues. The OSART experts visited KANUPP from 7th to 19th January 1989 to review

operating practices at the plant and to permit a technical exchange of experience between the experts and their plant (KANUPP) counterparts on how the common goal of excellence in operational safety can be pursued further. It was a standard OSART mission and covered all the review areas. The team reviewed the plants operational safety indicator and other related documentation. The team particularly observed the work being carried out in the Control Room and in the field by operation personnel and held detailed discussion with the counterparts. In this connection there was a thorough exchange of experience, opinions and ideas.

The OSART found a dedicated and motivated management team supported by skilled operation workforce. The workforce was very competent as far as their technical competencies were concerned. But still there were problems in the Operations. Many unusual occurrences could be attributed to the human factor related errors. The mission realized that something was missing in the training, which needed to be improved.

The mission observed that there was sufficient staff in the operations team for all modes of operation with specific minimum numbers of staff to meet the requirement of the operating polices and principles. There were five shift crews. Authorization training of licensed shift and control room staff was carried out on an informal basis on supernumerary days (supernumerary days and some rest days are grouped together and used for "on call" need or standby purpose to replace absent shift staff). The mission observed that this approach does not allow sufficient formal training to match international practices.

SOLUTION SUGGESTED

The mission recommended that the operation organization be re-organized, increasing the number of shift crews to six and formalizing the training for licensed and control room staff. The team emphasized that sufficient time be made available for training and that this activity be carried out as "family" training without being compromised by other commitments. Going from five to six crews would support continuing safe operations, development of refresher / upgrading training and recovery from hectic shift work.

CONCLUSION

It can be said without reservation that creation of the sixth crew in the Operation department of KANUPP in 1989 proved to be a turning point in enhancing the overall training program in general and creating an awareness of the importance of human performance competencies in particular. As mentioned earlier the operational problems being faced at KANUPP were attributed towards lack of training. Formation of sixth crew triggered a new strategy of training focusing on development of soft skills.

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Annex J

KOZLODUY NPP, COMPLEX PSYCHOLOGICAL METHOD FOR ASSESSMENT

1. NEED

The need for a complex psychological method for assessment has been identified by:

(1) The enhanced requirements for human factor reliability which are established in compliance with Kozloduy NPP's Mission — "safe, reliable, efficient and environmentally friendly plant performance";

(2) Written requirements including the regulatory authority's requirements; requirements resulting from the utility (NEK) regulations, and the nuclear power plant's regulations.

(3) Results from analysis of human factor related events at Kozloduy NPP and other power plants.

The target audience for this assessment was determined to be top and middle level plant managerial personnel.

2. IMPLEMENTATION APPROACH

2.1. Objective

Managers greatly influence the interrelations between the people whom they control as well as their motivation for work. Therefore it is important that managers working at NPPs have an adequate style of management and the characteristics needed for development. When one knows his/her weak points, usually a motivation to overcome them is provided. When these weak points are familiar to the management, conditions could be created to overcome them by training sessions and qualification courses. This depends to a great extent on individual ambition for self improvement, as well as on the preparedness and understanding of senior management. Thus, knowing the features and the behavior patterns of the people concerned, management could, for the sake of optimal output, put the respective staff at a working place, where he/she would be most beneficial.

The purpose of the Project is to assess NPP managers' behavior by use of a complex assessment method, standardized for the Bulgarian population. The objective is to receive a psychological assessment of human performance. The psychological assessment aims to analyze the behavior of selected categories of managers from different points of views by the method "Assessment Center". By this method the strong and the weak sides of the behavior can be assessed and assigned to the respective management level requirements.

2.2. Focus

The "assessment center" Method includes a procedure for defining criteria for management behavior assessment, for implementation of the investigation and for receiving the final psychological assessment. The procedure is created by an algorithm, which is specific for different target audiences. The assessment is done by a consensus among the team

members. The investigation takes one working day. In this concrete case, the criteria are specified for five groups of managerial personnel:

* Head of Division;
* Head of Section;
* Chief Technologist
* Senior Expert;
* Senior Inspector.

The summarized criteria include:

(1) Communication:
    * Ability to convince
    * verbal communication

(2) Influential behavior
    * flexibility
    * tactfulness

(3) Leadership
    * planning
    * organization
    * control

(4) Problem resolving behavior
    * creative activity
    * realistic perception
    * ability to identify a perspective

(5) Motivation
    * taking initiative
    * activity
    * willingness for self-improvement
    * willingness to follow standards

(6) Personal characteristics
    * emotional steadiness
    * physical and psychological health
    * respect for authority

2.3. Assessment methods

Four kinds of methods are used to evaluate the criteria.

2.3.1. Interviews

The following kinds of interviews are used:

* Amanuensis type of interview - personal data, data related to the education and the professional history of the investigated person.
* Criteria type of interview - contents are established on the basis of the accepted criteria for the corresponding job position

2.3.2. Simulations

Through simulations, actual behavior is recorded in a problematic situation close to the professional reality of the investigated categories of managers. The following simulations are applied:

- Group simulation
- Individual simulation

2.3.3. Tests

Personality type

The *Test of Cooper* is for investigating professional stress. It consists of six levels and three questionnaires. Two of them are intended for subjective assessment of the physical and the psychological health, and the others are for behavior of type "A". Behavior of type "A" is assessing the venturesome attitude and the willingness of the investigated person to take part in as many as possible activities, due to which such people work in time deficiency, which puts additional pressure on them. In medical records we have proof that people of such type of behavior are susceptible to cardiac infarctions, cerebral apoplexies, and generally they are suffering more from stress induced illnesses.

Test of Franken is for investigating the style of behavior , the decision making manner, planning and responsibility. The role of the person in the subscale activity/vigor of purpose and individual responsibility in problem resolution is evaluated.

Cognitive

Slowcum Questionnaire is for investigating the sensory intuition and consists of two scales.

First Scale — used for investigating the cognitive styles, which are featuring the way of information perception and problem resolution. By means of the questionnaire a differentiation can be made between individuals who prefer to get detailed instructions and those who are content to get general instructions leaving them more flexibility.

Second Scale — used for making differentiation of priorities in decision making whether decisions are made on the basis of objectively existing necessities or are based on personal emotional attitudes.

In general, the Slowcum Questionnaire defines the cognitive individual preferences in gathering information and making decisions.

Curtan Questionnaire is based on the theory of the adaptive - innovative style. It defines the expected behavior during the phase of making decisions related to administrative and organizational problems. A differentiation is made between the indicators originality, conformity, and pedantry as characteristics of decision making.

Questionnaire for assessment of the styles of management (modified by Russinova B. and Vasileva L.) is applied for investigation of the style of management:

* industrial style - directed to efficiency;
* administrative style - directed to fulfillment of rules and norms;
* innovative style - directed to implementation of new methods and approaches of work;
* integrating style - directed to the people and their joining.

Psychological literature indicates that a good manager is a person who knows how to use multiple styles of management and properly applies them according to the situation.

Quickness of mind

Test of Kettell - for investigation of the intelligence and quickness of mind in problem resolution.

3. RESULTS

The Assessment Method has been developed and adapted to specific NPP demands. It is conducted at the Psychological Laboratory of the plant. In order to create and prepare the team, which is going to perform the investigations, the training of five people working in the human performance areas is foreseen. Thirty two managers from Kozloduy NPP have been assessed during the first investigation. This resulted in the development of their behavior profiles.

The results can be used for initial professional selection and for the continuous assessment of managerial personnel. The possibility of its application to senior operational personnel is also being. As a result of the project implementation three categories of managers were defined:

- Managers whose professional performance is dominantly positive; they are prepared for additional responsibilities/assignments.
- Managers who fit well into their job positions, successfully cope with it, but have some deficiencies which could easily could be overcome by training courses.
- Managers, who manifest managerial performance deficiencies, while their general behavior is ranging around the middle of the scale. They should be used more carefully, and additional training and education are compulsory for them. As a positive fact, only 15% of the investigated people from Kozloduy NPP are considered to be of this category.

A potential problem was noted concerning the specificity of the work and results interpretation: the responsibility of the team performing the investigations is great. This leads to some additional requirements for the selection and the training of team members.

4. LESSONS LEARNED

The "assessment center" method was proven to be a suitable tool for psychological assessments of managers from different levels. Depending on the specificity of the particular application it is modified to a different degree in order to optimize the results.

Through a plant management order, the method has been implemented in the Kozloduy NPP by specialists from the Institute for Psychology of the Bulgarian Academy of Sciences with the participation of the Psychological Laboratory of the plant and the Training Center. Following analysis of the implementation of the method in other large industrial enterprises, three stages have been defined , especially for the Kozloduy NPP:

* adapting the method and deriving of limits;
* training of a team to perform the investigation;
* performing the investigation and preparing the assessments.

The approach is suitable for transfer to other organizations, following an adaptation considering the respective organization. For example defining specific criteria for corresponding categories of managers and estimating the method which could be included in the Assessment Center, adaptation of the methods and training of the respective team, and determining who will implement the procedure.

5. CONTACTS

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Annex K

GROUP DYNAMIC VIDEO-TRAINING AT THE KOZLODUY NPP

1. NEED

1. Group Dynamic Video-Training (GDVT) at the Kozloduy NPP is intended to improve the overall Kozloduy NPP performance by enhancing human factor related competencies. It was considered as a performance supporting active-training module system leading to reductions in number and consequences of human errors.

The planned training activities are based on the first three methods for assessment described in Annex J and enhancement of:

- employee skills for work task performance (man-machine interface, teamwork, communications, etc.);
- routine and stress situations behavior and response;
- organizational culture;
- analysis of events due to human errors.

The main reasons for human errors of the new employees after successful adaptation to work are:

- The drift of their motivation
- Accumulated stress due to changes in their life course (professional and private)
- The way they learn lessons from the mistakes of others or their own.

1.2. Focus

GDVT is an additional to the planned training activities, included in the training programs of Kozloduy NPP personnel to become aware of soft skills and practice them. GDVT topics are directed to the following target groups:

- heads and deputy-heads of section in administrative departments, main production departments and auxiliary departments and stand by personnel;
- marketing group;
- public relations (PR) and internal relations (IR) personnel;
- other personnel in contact with external clients;
- senior operational personnel;
- line managers;
- top managers.

This training is a relatively new practice. Thirty two people have been trained by GDVT by external trainers up to now. Meanwhile training of NPP trainers is being done so that this practice can be continued.

2. IMPLEMENTATION APPROACH

2.1. Introduction

At the beginning of every training session an assessment was conducted to define the "entry level" of interests, motivation, communication style in normal (routine) and extreme situations, teamwork compatibility, and accumulated stress due to changes in their life course (professional and private). The results of the "exit level" needs a pilot period to prove the range and stability of the behavior al and skills improvement of the trainees.

2.2. Contents

2.2.1. GDVT module: Teamwork and team compatibility training

Objectives: Enrich skills of relations between individuals in routine and crisis; improve personal autonomy in teamwork. Avoid communication "killers" strategies. Facilitate group and individual change. Encourage team building processes and phases.

Test methods for diagnostics of the training group members through investigation of their behavior in normal situations and under stress:

* accumulated stress at the moment
* preferable channels for acceptance and expressing information
* communication models in normal situation and under stress
* resistance in crisis (profile), personal characteristics, motivation.

Major tasks of the group were:

* modeling of the problematic situation
* techniques for presenting statements from the team associates
* team build up - principles of selection, subordination, member autonomy
* Styles and methods for associates motivation
* Social roles in the team, significance of the communication in the team
* factors of interrelations between individuals.

2.2.2. GDVT Module: Communicational skills for business talks and negotiations

Objectives: Master the sequence of partial goals in communication according to the partners' position, provide feedback and share experiences in the course of the communication. Build skills to find points of mutual interest in complicated and problematic situations. Improve

sensitivity to receive and send verbal, nonverbal end emotional messages. Control the process of sending verbal, nonverbal end emotional messages. Apply different communication models with different types of partners.

Test methods for assessment of group members entry level concerning the direction of the individual motivation:

* "toward interrelations with people",
* "toward task oriented",
* for the predominant style of communication in crisis (in two directions "power — obedience" and "aggression - cooperation").

Training subjects:

(1) Techniques of moderation;

(2) Techniques for conducting a business conversation and negotiations (partial goals in conducting conversations and negotiations; reactions towards the partner; reaction to the emotional status of the partner and sharing own experience from the conversation; feedback supply). Video records were used as training aids.

(3) Individual plan for the personal career development. When this module was performed with the plant top management, additional micro-training was performed on reading the key elements from the verbal and nonverbal information provided by the partner (hearing, seeing and emotions).

2.2.3. GDVT module: Managing extreme situations and conflicts

Objectives: Identify appropriate strategies to cope with conflicts in a positive, constructive manner respecting position, and time limits; apply 4 fields model for coping conflicts with individuals (avoid, compete, conform, collaborate); apply 5 fields model for groups conflicts. Identify the way to cope with role conflicts (functional and hierarchical) and motivation conflict.

Training subjects:

(a) types of conflicts

- **"** formal business discussion" - "relations normalization" - individual discussions are transferred to the management or to the team
- "Psychological antagonism" - the area of contradictions is not defined and there is a trend of expansion.

(b) phases of conflicts

- background
- identification
- psychological rupture

- ♦ re-assessment of values
- ♦ conflict output

(c) managerial styles of coping with conflicts

- ♦ coping with conflicts by force
- ♦ diversion of the conflict
- ♦ the compromise

Case studies were applied in training.

2.2.4. GDVT module: Assertive behavior , nonverbal comunication and willingness to change

Objectives: enhance stress resistance skills. apply effective and assertive ways to cope with crisis situations. Conduct self-assessments of communication and basic skills and human rights. Develop the feeling of inner value and power. Transform "I must" into "I choose". Cope with anger and guilt. Apply assertive reactions to criticism. Cope with fear and stress in an assertive, positive way.

Contents:

The following specialized modules were applied:

- problem identification, motivation personal peculiarities testing, accumulated stress up to the present moment (change in life, stress factors in the working environment)
- discomfort area and readiness to change (role-playing)
- peculiarities of self-recognition
- verbal and non -verbal aspects of self-recognition
- techniques for self-recognition (assertive behavior)
- the right of choice
- techniques to cope with critics and blame

Results of this GDVT module are:

- ∗ learning techniques of reading partner's status
- ∗ learning techniques of self-recognition
- ∗ coping with fear and stress by assertive behavior
- ∗ conflict management

2.2.5. GDVT module: Problems which I face in my work:

Objective: Recognize problems within a protected environment. Identify reasons for problems arising.

Content:

- Drawing out problems within a small group and their presentation at a forum of the whole group.
- Individual assessment of the weight of the three most significant problems.
- Discussion of the obtained results.
- Brain storming attack for resolution of the three most significant problems.

3. RESULTS

Summary results and the final report of the tests and training activities were made available to Kozloduy NPP management. Each trainee received his/her individual results and recommendations for personal consideration.

3.1. Issues

The most significant issues which resulted from the preliminary psychological tests of the training participants were the following:

* Spontaneous interest in "man–machine" interface; easy accumulation of good practice and skills in this area;
* The interest in "man–machine" appears mainly when a problem arises and later on does not exist anymore.

3.2. Subgroups

Three subgroups appeared according to their interests profile:

A group — will feel great satisfaction as **production managers** ("man–machine" interface — "symbol matters")

B group — will feel great satisfaction as **line managers. (**"human relations" — "symbol matters")

C group — will feel great satisfaction as **personnel managers**. ("human relations" — "man–machine interface"). They are naturally evolved candidates for "high involvement leader", "fireman" in crisis.

3.3. Leadership types

Results related to leaders suggested that they could be divided into three almost equal groups of leaders:

- Efficient in situations which are extremely favourable or unfavourable for them (tasks are not well structured, the group atmosphere is bad and their positional power to motivate subordinates is weak). Those leaders represent the existing human resource for crises or for promotion of "unpopular innovation". They will need refresher training after 3–6 months.

- Mixed managerial style and they could easily switch to different leadership strategies according to the situation (or to the demands of their superiors). The leaders from this group will need supportive training after 8-10 months.
- Most efficient in well structured tasks and weak positional strength to motivate subordinates or unstructured tasks but strong positional power. These leaders could s calm tension and keep high productivity levels after "crisis or "unpopular innovation" implemented by other managers. This group will need supportive training after 10-12 months.

3.4. Problems/solutions

A databank of derived problems and conflict cases and solutions was created from the material the managers presented during training sessions on behavioral and organizational change.

The problems reported by the managers were grouped in several categories. Their distribution on the four dimensional model of the organization of L. Bolman and T. Deal is as follows:

(1) Structural (achieving goals)

(2) Systematic and human resources approach (exchanging services)

(3) Political dimension (resolving problems, and distributing resources)

(4) Symbolic (sharing mutual values)

The solutions proposed by the managers for the reported problems were grouped in 28 categories, and also on the four dimensional model of L. Bolman and T. Deal shown above. Based on these results changes were implemented in the supporting program activities.

4. LESSONS LEARNED

Trainees managed to define their difficulties and to see some interrelations between them.

Trainees were able to understand that plant management not only tactical, but also strategic priorities as well.

This training resulted in recommendations and suggestions by the participants to the plant management for improvements related to (for example):

- formal communication systems;
- creating a more flexible motivational system;
- defining of professionally significant indicators and their evaluation criteria.

Trainees insisted on availability of feedback. They fully understood that not all of their ideas would be implemented, but to define terms and priorities could be considered as satisfactory results.

The training was assessed as beneficial; plant trainers are being trained and future consultations have been foreseen.

GDVT modules could be transferred for use by other organizations after some preliminary investigations and adaptation.

5. CONTACT

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Annex L

EDF OPERATIONAL COMMUNICATION DURING "REAL WORKING CONDITIONS"

Simulator session for NPP control room personnel

Training goals

Identify the operational communication practices in a shift team including its environment.

Acknowledge the operational communication as a professional practice necessary to conduct operations.

Emphasize operational communication extent according to safety and quality in operation.

Specific objectives

At the end of the training session the trainee will be able to:

⇒ Search information useful to diagnose, criticize them, validate them and use them with the available means in the control room.
⇒ Identify the roles of the different persons working in the control room using the simulator session to better understand his own role within the team and to take the appropriate technical decisions.
⇒ Communicate to the appropriate people the information according to their experiences and competencies.
⇒ Proceed to a preparation work, when possible, before communication.

Pre-requisites

The trainees within the shift team must be able to, using the simulator session or their experience feedback, to formally explain an event and to emphasize the importance of the communication.

Key points

- Definition of the operational communication
- Loop: « information - decision - action » (fig. 1 page 4).
- Work on improvements on: information, preparation of action, co-ordination and context.
- Adjustment of the loop: « information - decision - action » to field operators actions.
- Adjustment of the loop: « information - decision - action » to problem solving in group.

Pedagogical strategy/method/duration

Using the facts observed on simulator:

- Identify the malfunctions in the perception of information phase and search of information.
  ⇒ Information not transmitted
  ⇒ Encountered difficulties on means (written, oral, computerized).
  ⇒ Passing on difficulties (clarity, accuracy of the content, no feedback of a message).
  ⇒ Documentation problems (unavailability, incomplete, inaccurate...)

- Identify the analysis phase

  ⇒ Take into account the relevant information.
  ⇒ Criticizing wrong information.
  ⇒ Search for complementary information.
  ⇒ Take into account abnormalities.

- Decision making

  ⇒ No critique or argument, the trainee is under influence.
  ⇒ Competencies or experience of the interlocutor not taken into account.
  ⇒ No decision making or not in time.
  ⇒ Clarity and accuracy of the action demand (communication, preparation).

- Identify the co-ordination problems

  ⇒ Actors are isolated.
  ⇒ No global logic felt by the actors.
  ⇒ Respect of the chronological order of the actions.
  ⇒ Experience feedback taken (or not) into account.

- Identify the context of the actions

  ⇒ Routine.
  ⇒ Unusual activities.
  ⇒ Unscheduled interruptions.
  ⇒ Relationship between the actors.

Analysis in the classroom

- Present the loop: « information - decision - action » (see Figure 1)

  ⇒ Explain the logical path of the loop.
  ⇒ Take an opportunity to present the « loop » (e.g. abnormality described by a trainee).
  ⇒ Better is to take a good organization of the team as an example.

- Definition of the operational communication
  ⇒ Once the « loop » has been explained, present the definition of the operational communication.

- Method of problem solving in group

⇒ Use the video to demonstrate that the « loop » is a useful tool to structure the problem solving in group.
⇒ This can be divided into 4 steps:

- ♦ Gathering of information coming from the process (alarms, recorders...), the documentation, the trainees (clarity, accuracy, comments, judgements).
- ♦ Analyzing: questioning attitude facing at he information and also within the team.
- ♦ A common goal defined (or not) by the team.
- ♦ Decision making according to the objectives.

Focus on the fact that the team includes people dealing with different roles:

⇒ The Shift Engineer with the decisions
⇒ The Technical Supervisor with the information
⇒ The Operators with the Main Control Room actions.
⇒ The Field Operators with the actions on the field.
⇒ The Safety Technical Advisor with safety.

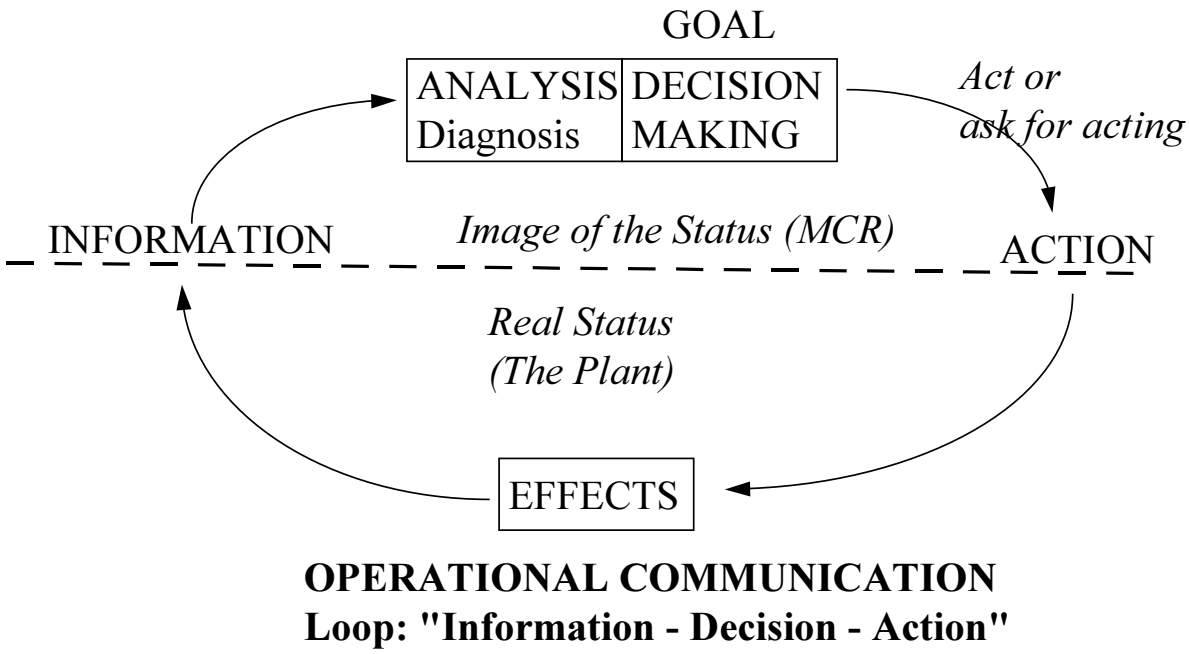

Fig. 1. Operational communication loop.

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Annex M

SOME ASPECTS WITH RESPECT TO THE TRAINING OF ROMANIAN NPP PERSONNEL ON HUMAN FACTOR RELATED COMPETENCIES

1. Overall description of the Training System

1.1. Training concept

In the case of the first nuclear plant in the country, which is the case in Romania, the establishment of a training concept must take into consideration the educational system and the industrial development stage of the country, and it also must be based on the experience of the countries with developed nuclear programs. For the Cernavoda NPP, the training concept was based mainly on the training systems established in other CANDU utilities. This permitted an easy integration of off-shore training opportunities with the domestic program.

In August 1991 the Romanian Electricity Authority (RENEL), the former organization, signed a contract with a Consortium (AAC) formed by AECL Canada and ANSALDO Italy. The main scope of this contract was the provision of all resources, services, equipment, tools, materials and supplies required for the completion of the Unit 1, the management and control of all work associated with the Unit 1, including operating the unit and training of the personnel for a period of 18 months.

1.2. Training organization

The training activities for the NPP personnel in Romania are achieved under the responsibility of the Training Department of the Cernavoda NPP. The general training, the theoretical specific training, basic skills training and simulator training are delivered at the Cernavoda Nuclear Training Center, part of the Training Department, located very close to the plant. The Cernavoda Nuclear Training Center is a new and modern one provided with a full scope simulator. Job specific training (on-the-job training consisting of field check-outs, work assignments, commissioning participation, co-piloting, specific skills) is delivered in the plant under co-ordination of the plant departments training co-ordinators.

2. Training activities

2.1. Achievements to date

In accordance with the established training concept, the Cernavoda NPP operations personnel training was accomplished in two phases: 1) transition and 2) maturity.

2.1.1. Transition phase:

This phase encompassed commissioning, fuel load, pre-operational testing, start up and initial operation of Unit 1 through the period of contracted operation. During this period the following training activities have been undertaken with high priority:

- Continuing training and qualification of the Romanian staff for field positions within the shift operating complement.

- Full utilization of the Romanian operating staff trained at Point Lepreau (1992-1994) in such a way that they gain necessary field and operating experience with respect to overall plant operation prior to application being made to CNCAN for them to hold licensed positions on shift. For non-licensed positions, authorizations have been done by station manager's approval.
- Successful completion of the Romanian CRO/SS Licensing Program.
- Completion of the radiation protection training for all station staff.

Most of the Cernavoda NPP operations staff have finished their initial training; part in the country, part off-shore. Thus, 25 persons were trained until 1991 in CANDU stations in Canada and Argentina. Another 93 persons occupying key-positions at the station have been trained in Canada at the Point Lepreau NPP, between 1992-1994 (lasting 4 to 24 months, depending on the position). During their training they received supervisory and management training. An important number of Romanian NPP operations personnel benefited from IAEA technical co-operation assistance, participating in different forms of training such as fellowships, training courses, scientific visits, workshops, on different subjects. The training program of the Romanian staff has been continued with appropriate on-the-job training, simulator training, co-piloting during commissioning and the initial operation of the Unit 1.

The operations activity for the first 8 months following criticality was the responsibility of AAC, all managers and supervisors including Shift Supervisors, Control Room and Field Senior Operators were expatriates with extensive nuclear plant experience. Each of them had a Romanian deputy (or counterpart), so that the development process was continuous.

2.1.2. Maturity phase:

Upon completion of the transition phase, Romanian staff assumed, in principle, all station operations positions including all licensed positions. The transfer of positions (tasks) and responsibilities related to Unit 1 management from AAC to RENEL- Branch of the Cernavoda NPP occurred in June 1997. The transfer was prepared by a laborious activity for more than four months, a period when the Consortium staff together with the Romanian staff carried out the detailed evaluation of each technological system, elaborated the appraisal for the Romanian management staff, and performed an evaluation of the sections (departments/ compartments) of the plant.

The results of this activity were recorded in a large transfer file signed by AAC and RENEL representatives. This document emphasized the fact that Unit 1 Romanian staff have gained training and qualification and have the capacity to operate the plant in a safe and proper basis. In August 1997, as a result of the evaluation of the documents, the staff and the nuclear plant status (condition), the National Committee for the Control of Nuclear Activities issued, in compliance with the law, the test operation license (authorization) for Cernavoda NPP Unit 1. At maturity, NPP Cernavoda training program will have addressed the establishment of a systematic training and qualification process for all the identified operating positions.

This represents the development to maturity of the training and qualification processes initiated during the transition phase and, in particular, establishes a comprehensive training program according to all the job-related training requirements (JRTRs).

2.2. Present and planned training activities

2.2.1. Objectives

Continued focus and priority are needed to develop and deliver training for station staff in a timely manner. This effort will further ensure personnel have sufficient knowledge of plant systems, position-specific skills, industrial safety, work practices, and other plant policies.

We agree that it is necessary but not sufficient for NPP personnel to have the required technical knowledge and skills. To ensure effective and efficient operation and maintenance, personnel must possess the appropriate human factor competencies and interface with their colleagues in a way that increases the likelihood of good operations and safety practices, including adequate and timely actions. Training must cover such aspects as communication skills, behavior , etc., and point out the reasons for their importance.

With respect to this, we decided that it is a priority and need to supplement our NPP personnel training program with training courses on supervision and management in order to improve human performance competencies of our NPP personnel. The overall objective of these courses is to provide individuals with the skills they require to function effectively as a member of the management team.

2.2.2. Issues

During the design, development and implementation of the human performance training courses, the following questions have arisen and we were trying to manage them:

- What categories of personnel are to be trained in this area?
- There is a great diversity of human performance competencies identified by the documents of the IAEA and others. Which would be the minimum necessary human related factor competencies?
- How can human performance training courses be integrated in the NPP overall training program?
- Who would be the most appropriate lecturers (teachers) for these training courses?
- Are only training courses sufficient to permit individual NPP personnel to get and/or to improve the human performance competencies, or, in addition, must the organizational frame be improved in order to support NPP personnel in carrying out their assignments?

2.2.3. Courses

The Training Department of the Cernavoda NPP developed training courses on human factor related competencies topics for three categories of personnel:

- Senior managers
- Heads of compartments (supervisors)
- Employees (workers)

Until now, the training courses for senior managers have been implemented, those for heads of compartments are in progress just now, and those for employees will be done in the next months. Senior managers have been trained almost simultaneously. They then lead the training for heads of compartments who then will train their direct subordinates. Provided below is the list of the courses:

- Roles within organization
- Working/supervising in a nuclear environment
- Communication skills
- Time management
- Problem review/solving
- Decision making
- Team building/conflict resolution
- Planning/management projects
- Observation & coaching
- Staff selection
- Delegation
- Negotiation
- Economics management

The courses are delivered in individual training modules (blocks) with each module having a duration of 1-2 weeks, for a group of 10 -15 trainees. They consist mainly of classroom lectures. Some practical applications are included at the end of the module.

2.2.4. Course content

Some examples of the course content for different topics are shown below:

* *Roles within organization***.** The course introduces the trainees to typical organizational structures, their strengths and weaknesses, and the roles and responsibilities of individuals at each level in the organization.

* *Working/supervising in a nuclear environment***.** The course identifies at least ten factors for nuclear electrical power production in a safe and efficient manner; it also identifies the safety culture monitoring indicators.

* *Communication skills.* The course identifies potential barriers to effective communication, from both an organizational and an individual perspective and practical techniques for minimizing these barriers.

* *Time management*. The course presents the following:
  - Establishing long term and short term goals
  - Identifying common time wasters
  - Techniques for finding more time and energy each day
  - Helping subordinates manage their time effectively

* *Team building/conflict resolution.* The course examines the supervisors' role with respect to building and maintaining a work team and how to overcome common barriers; the skills required to encourage consensus and co-operation and conflict resolution are introduced and practiced by all participants.

2.2.5. Performance evaluation

According to station procedures, Performance Appraisals of Cernavoda NPP Personnel are done:

* at least annually for the all personnel
* at 3 to 6 months intervals for supervisory personnel
* at the end of the probation period for the new appointees

Personnel performance appraisal are made by giving marks for each subordinate by his department manager, according to job requirements and taking into account besides the required technical competencies, most of the human factor related competencies that the above training courses deal with. There are four levels of personnel performance, depending on received marks:

- unacceptable
- below standard
- good
- superior

Supplementary training is provided for the personnel with below standard or unacceptable performance These personnel are declared "under observation" and the performance appraisal is done at 3 - 6 months intervals.

3. SUMMARY

We consider that the very good operation performance achieved by the Cernavoda NPP in its first three years of commercial operation are, to a some extent, the result of implementing the training courses on human factor related competencies.

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Annex N

HUMAN FACTORS IN THE UKRAINIAN NUCLEAR ENERGY INDUSTRY: SOFT SKILLS TRAINING

NPP PERSONNEL SOFT SKILLS TRAINING

Activities dealing with the solution of problems in plant personnel training in the area of soft skills started in Ukraine in 1997 within the framework of the TACIS project «Ukrainian National NPP Personnel Training System». A concept of the training of NPP high level management was developed. The main issues of the concept were:

1. ANALYSIS OF THE CURRENT SITUATION OF THE NPP's TOP MANAGERS TRAINING

The current situation analysis of the managers training in the nuclear power sector in Ukraine showed the following problems:

MAIN PROBLEMS IN THE PROFESSIONAL DEVELOPMENT OF MANAGERS IN THE UKRAINIAN NUCLEAR POWER SECTOR.

- The Absence of a National training system for the nuclear power sector managers.
- Main problems in motivating the managers with regards to professional development.
- Problems of professional development and career management of managers.
- Program realization problems.
- Nuclear power sector management training problems in the Ukrainian Institutes.

2. NEEDS ANALYSIS

2.1 METHODOLOGY FOR IDENTIFYING MANAGEMENT COMPETENCIES

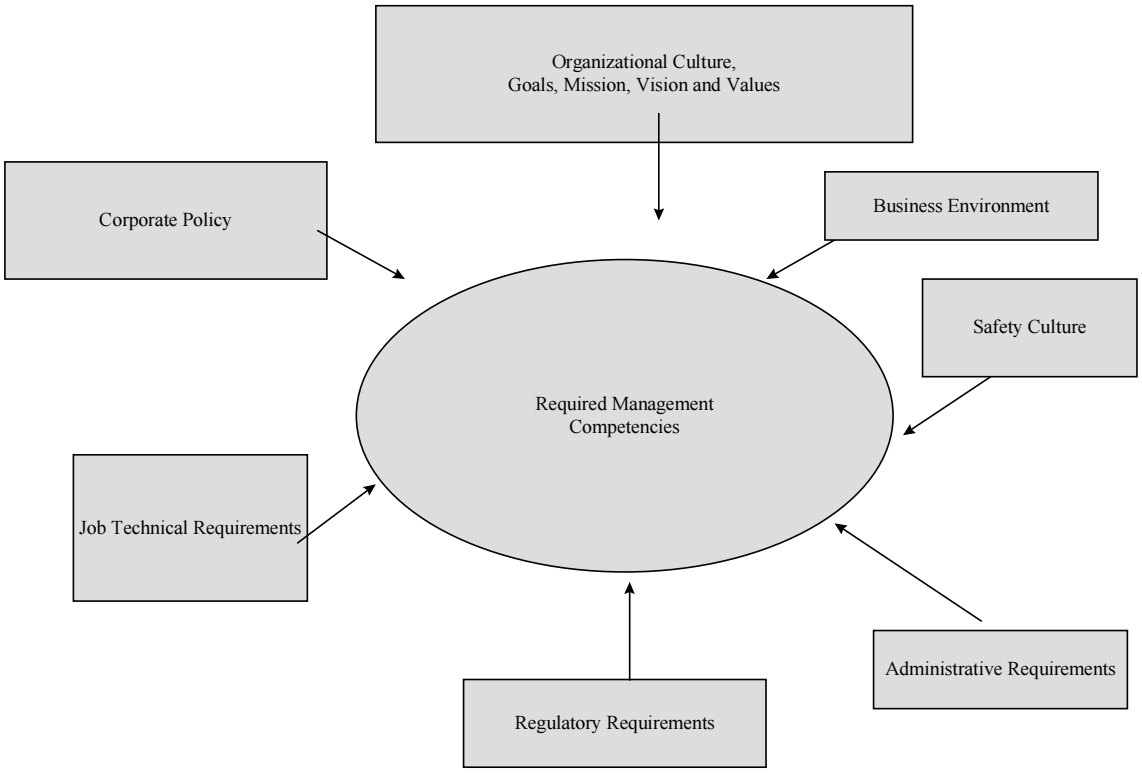

FIG. 2.1. Key categories of factors influencing the competencies required by managers.

2.2. IDENTIFICATION OF KEY MANAGEMENT COMPETENCIES

Based upon the analysis of the existing situation, considering the key factors influencing NPP management personnel training and taking into account the IAEA recommendations, the working group identified 11 key management competencies that are needed to be developed for managers of the two above-mentioned categories. The competencies are as follows:

(1) Communication;
(2) Group work;
(3) Analysis and resolution of problems;
(4) Economic and financial control;
(5) Anticipated management of human resources;
(6) Elaboration of company development strategy;
(7) Achieving results;
(8) Change management;
(9) Influence and leadership;
(10) Safety management;
(11) Working with experts and consultants (internal and external ones).

2.3. ABILITIES ASSOCIATED WITH KEY MANAGEMENT COMPETENCIES

1- Communication

- Transmitting and receiving information and assuring feedback
- Active listening
- Public speaking
- Producing written information
- Learning to distinguish between facts, beliefs and feelings
- Mastering a foreign language
- Mastering modern means of communication

2- Group work

- Preparing and conducting a meeting, discussion, negotiation and interviewing
- Ability to convince and argue
- Favouring the expression of group members
- Elaborating and respecting the rules of the teamwork game
- Regulating conflicts
- Facilitating the production of the group
- Fixing the status and objectives of a working group

3- Analysis and resolution of problems

- Identifying and formulating the problem
- Identifying the composing elements of the problem
- Prioritizing the problems between themselves;
- Identifying the context of the problem and determining its difficulty
- Evaluating the problem compared with the possible risks
- Collecting and sorting out the pieces of information relative to the problem
- Searching ways of solving the problem
- Identifying the population concerned with these solutions

- Evaluating alternative solutions
- Choosing the possible solutions

4- Economic and financial management

- Analyzing a financial balance sheet
- Defining spending priorities
- Finding ways of cutting expenditure
- Defining new business strategies in order to achieve the highest possible return from investment
- Measuring the economic impact of a project or a decision
- Studying the new needs of clients
- Establishing a Business Plan and calculation tables
- Identifying new sources of benefit

5- Anticipated management of human resources

- Elaborating personnel policy based on company strategy
- Defining the competencies currently required and anticipating the competencies needed in the future (quantitative and qualitative)
- Motivating the personnel regarding the objectives of the company
- Creating favourable conditions for the professionalism of personnel
- Selecting a management reserve
- Training future managers
- Evaluating the potential and personal characteristics of managers
- Evaluating the activities of managers

6- Elaboration of a company development strategy

- Understanding the visions and the values of the company;
- Prioritizing work in line with organizational goals and goals set by others;
- Developing long-term strategies and policies;
- Identifying the internal and external impact on strategies and policies;
- Identifying stakeholders' needs;
- The environment;
- Choosing the tactics of achieving strategic goals;
- Planning the actions to fit the strategy and policy of the company;
- Contingency planning.

7- Achieving results

- Defining the objectives and expected results
- Defining the organization in its reality
- Choosing priorities for achieving results
- Tactical planning
- Organizing
- Managing processes (projects and activities)
- Controlling
- Assessing and improving performance continuously
- Leading to achieve results

8- Change management

- Optimizing the correlation between resources and results to be achieved
- Identifying the successive steps
- Identifying and obtaining the necessary resources (human, financial...)
- Managing the conflicts, negotiating with those who are against changes

9- Influence and leadership

- Winning support from others and directing them towards a goal
- Expressing ideas clearly to individuals or groups
- Understanding the company culture
- Anticipating and managing disagreements
- Utilizing personal characteristics and features
- Being a leader
- Being persuasive

10- Safety management

- Controlling risk
- Establishing a safety culture
- Identifying the degree of risk in implementing innovative decisions
- Monitoring the degree of risk
- Making decisions in compliance with the primary safety requirements

11- Working with experts and consultants (internal and external ones)

- Evaluating his/her own knowledge critically
- Choosing experts and consultants
- Identifying the influence of a managerial culture on an expert
- Defining the results expected from an expert

2.4. Identification of key first priority management competencies

After developing the list of key management competencies, the selected competencies and the identified priorities were validated. For that purpose, the group of local experts carried out questioning and interviews with top and middle managers of each Ukrainian NPP. Both top and middle managers prioritized the competencies for themselves and for the others. The main objective of these activities was to obtain information from the personnel filling top and middle management positions. This allowed the development of the complete list of key management competencies and the identification of the priorities in those competencies. This list will be used in the development of training plans and programs for NPP management personnel, for short-, middle- and long-term periods.

More than 50 top and middle managers were involved in these questioning and interviews sessions.

CATEGORY NUMBER	PRIORITIES OF TOP MANAGERS	PRIORITY RANKING
6	Company development strategy	1
4	Economic and financial control	2
3	Analysis and resolution of problems	3
10	Safety management	4
7	Achieving results	5
5	Management of Human Resources	6
9	Influence and leadership	7
1	Communication	8
2	Group work	9
11	Working with experts and consultants	10
8	Change management	11
	PRIORITIES OF MIDDLE MANAGERS	
7	Achieving results	1
3	Analysis and resolution of problems	2
2	Group work	3
10	Safety management	4
9	Influence and leadership	5
5	Management of Human Resources	6
1	Communication	7
4	Economic and financial control	8
6	Company development strategy	9
8	Change management	10
11	Working with experts and consultants	11

4. PROFESSIONAL TRAINING PROGRAM FOR TOP MANAGERS

It is intended to develop a top level management selection, training and assessment system. This work has not yet been completed. The following provide examples of the work that has been done in this area.

4.1. DESCRIPTION OF SEMINARS FOR THE PROFESSIONAL TRAINING OF THE TOP MANAGERS

Seminar S1 *Problems and strategy of Energoatom*
Seminar S2 *Safety management*
Seminar S3 *Economics and finance management*
Seminar M1 *Decision making and problem solving*
Seminar M2 *Team management*
Seminar L *Human Resources management*

4.2. EXAMPLES OF WORK CONDUCTED

In 1997, a seminar based on documentation developed within this TACIS project was provided. Also, in 1997 some work on management training was started and within the INSP program, particularly, the training document «Management Basics» was developed. It covers topics such as:

- Management basics;
- Organizational activity;
- Art of communication;
- Motivation;
- Principles of teams management;
- Quality control;
- Ergonomics.

This document has established the basis for training documentation developed for different seminars.

In 1997–98 within the framework of collaboration «ENERGOATOM — BRITISH ENERGY» the project «ENERGOATOM Management Soft Skills Training» was successfully accomplished. The position of a Department Director was selected. For this position work was provided in accordance with all SAT Phases – analysis was performed, training program and training materials were developed, training courses were provided and evaluation of the above courses was performed.

In 1998 the TACIS project «Training of NPP Middle Level Management Staff» started. Based on the analysis of activity of major positions of middle level management competencies were defined for which training should be provided, in particular:

- Special technical knowledge;
- Safety management;
- Decision making;
- Change management;
- Stakeholder focus (customer/public);
- Communication;
- Project and process management;

- People development;
- Personnel characteristics;
- Achieving results;
- Influence;
- Business/commercial focus;
- Strategic thinking.

For training on the above competencies training a document for seminars was developed.

In 1998-99 within the framework of INSP the program project «Training Documentation Transfer for Position of NPP Unit Shift Supervisor» was successfully accomplished. One of the subjects for this project was the «Development of Training Documentation for Skills Improvement of Work with MCR Shift –Teamwork». Then, seminars on the above subject were implemented for the Ukrainian NPPs.

4.4. EXAMPLE LESSON PLAN

As an example of the training in the soft skills area the seminar «teamwork» can be considered.

TECHNICAL FILE FOR THE WORKSHOP «TEAMWORK COMMUNICATION»

1. Name and topic of the training

"Teamwork. Communication"

2. Trainees

NPP middle management staff: departments' heads and their deputies

3. Goals and objectives of the training

3.1. Training goals

The training should allow trainees to communicate effectively and use in full extent the potential of the personnel to achieve the work performance level required by the organization

3.2. Training objectives

Upon completion of the training the trainees will be able to:

- Communicate effectively
- Distinguish facts, opinions, emotions
- Use modem communication means
- Conduct negotiations
- Evaluate personnel
- Ensure feedback from the work of subordinated personnel

3.3. Key elements

- Communication
- Leader and team in modern environment
- Characteristics of a successful team
- Teamwork skills
- Benefits of teamwork
- Study of the problems associated with human behavior
- Modem information communication means

4. Organization of training

4.1. Place in the training plan

The workshop represents a part of the basic training for the middle management staff.

4.2. Main characteristics of the training

Training is conducted in the form of lectures with the use of examples.

4.3. Documentation and tools

- Method of active pedagogs
- Trainee handout
- Instructor guide
- Distributed materials
- Auxiliary materials
- Overhead projector
- Whiteboard

4.4. Size of trainee groups

8-12 people

4.5. Main characteristics of teaching

2-3 instructors to conduct training and one co-ordinator

5. Training conditions

5.1. Duration and schedule

One three-day workshop

5.2. Instructors' qualification

Minimum requirements:

- Higher education and general culture
- Work experience at NPP
- Authority with NPP middle management staff
- Work experience as instructor or trainer
- Additional training in the framework of the project

5.3. Training setting

Classroom

5.4. Requirements of trainees

Preliminary training and entry knowledge tests are not required

5.5. Control

Not planned

5.6. Place of conduct

Ukrainian NPP or ETC, Kiev

6. Review and revision

To conduct interviews and questioning (with questionnaire) immediately after the workshop in order to evaluate its effectiveness. Correction of training materials within a month after the workshop

4. CONCLUSIONS

The example shows that several pilot programs of training in the area of interpersonal relations were developed and implemented. Meanwhile, currently there is no systematic approach to this problem and we are only at the beginning of this activity. Nowadays, the task of ENERGOATOM is to organize complete work on Ukraine NPP management and specialist training in the area of soft skills using existing training documentation developed for different projects.

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Annex O

ELETRONUCLEAR BRAZIL: MANAGER DEVELOPMENT PROGRAM

I. INTRODUCTION

After the joining process of FURNAS Nuclear Area with NUCLEN to form ELETRONUCLEAR, a project was begun in 1996 to homogenize the management abilities of personnel from the two organizations according to the mission of the new organization, ELETRONUCLEAR.

This program has 116 class-hours and is going to be applied to 4 groups in 2 parts:

- "**Management through human development**" — with an approach to essentially human aspects of managing, required assignments, and abilities; and
- "**Instruments of strategic management**" — with technical, and conceptual aids for efficient, and effective management.

ELECTROCUCLEAR has entered into a partnership contract with the Brazilian School of Public Administration to develop ELETRONUCLEAR human resources, including this training program.

II. PROGRAM

A. Management through human development

The general purpose of this topic is to promote consciousness, and developing skills important to management (focusing particularly on issues in a high technology organization) – and clarifying concepts, principles, values, behavior s, and purposes necessary to fully apply ELETRONUCLEAR human resource policy.

The following programs are to be developed for this purpose:

A.1. "Integration seminar" 04 Class-Hours

- Promote group integration through mutual meeting.
- Check expectations of participants regarding the course.

A.2. Development of groups 12 Class-Hours

The purpose of this course is to enable participants to apply concepts of a new management model developing teams according to the scope of organizations.

3. "Ethics, and its implications on work, and life" 04 Class-Hours

4. Management, while essentially human 20 Class-Hours

- The purpose of this course is to raise of ELETRONUCLEAR managers to their technical, political, strategic, and social responsibilities.

B. Instruments of strategic management 80 Class-Hours

This topic will cover 5 subjects of 16 Class-Hours each as follows:

B.1. Planning, and strategic management

This topic will provide participants with an organization strategic view, enable them to develop diagnosis, and strategic perspectives, and discuss concepts, and methodologies for strategic management.

B.2. Projects: Basic concepts and assignments/management roles

Topics included here are systematic project management; execution, control and coordination; and development of teams for project management

B.3. Introduction to financial management

This topic provides financial concepts and present financial methods applied to daily real situations of organizations.

B.4. Management of human resources: Management practices and implications of Laborite Legislation

This subject is planned upon the basis that management is responsible for the human resources instead of the human resource department. Participants analyze and discuss trends in human resource management, its threats and opportunities, and mainly, what could be done to improve management effectiveness in this important field of organization management.

B.5. Information system for management

Develop participant's skills to improve production and reliability through management information systems.

III. METHODOLOGY

Lectures supported by movies and slides, required reading, discussions, individual and teamwork, and exchange of experiences.

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Annex P

SLOVAKIA: MCR OPERATOR SELECTION AND THEIR TRAINING FOR "MANAGERIAL SKILLS"

1. INTRODUCTION

In this annex the psychological selection, psychological re-testing and management skill training of main control room (MCR) operators are discussed. In the Slovak Republic the control room operators are classified as NPP personnel with the direct impact on nuclear safety and increased attention is given to their selection and training.

2. MAIN CONTROL ROOM OPERATOR SELECTION

The selection of NPP personnel for specific job positions against the psychological tests and periodical verification of personnel's psychological ability started in the middle of the seventies. This decision was taken due to the fact that the experience showed that there were events caused by human factor failure as a consequence of the increased psychological stress at these job positions at thermal plants.

Together with the development of nuclear power plants there were created job position with the direct impact on nuclear safety at NPPs. The job incumbents could perform their job only after passing specific training. In addition to this training it was also a requirement on these job incumbents that they are able to cope with permanently high psychological stress.

Psychological laboratories at NPP Bohunice, NPP Dukovany and in Bratislava started to solve the research task oriented towards the reliability of the human factor at NPPs. In the final report of this research task there was the discussion on the reliability of the human factor at NPPs namely in connection with the key and critical activities of the control room operators during the steady-state, transients, start up, overhauling and events at NPPs.

The next step was to design a method for evaluating the psychological ability of the control room operators. This method was used at first at experimental level. The method for the selection of control room operators was validated in view of the successfulness of control room operator's performance. On the basis of this method the method for periodical psychological testing was designed and verified. These methods were used for selection and periodical testing of control rooms operators at NPP Bohunice, NPP Dukovany and NPP Mochovce. Nowadays psychological working ability is defined as an ability to cope with job activities during normal and abnormal operational modes without negative impact on the control room operator's psychological state of mind.

The psychological test for selection of new job incumbents is aimed at excluding pathology, and to identify integrity and stability of a person, psychological abilities including current intellectual capacity, memory capacity, ability of attention and intentness, motivation for job performance, and to predict if the new job incumbent is able to pass the training.

Periodical psychological test is aimed to determine actual psychological state, current intellectual capacity, ability of attention and intentness, cognitive processes, reliability of decision making, changes in values and traits, and to predict the successfulness of the

operator's performance in relation with his carrier development. Retesting is done each two years.

The original methods for control room operator selection and periodical testing have been validated in accordance with the requirements of NPP operation, and the results of root cause analyses of events casued by human failure. On the basis of experience it is demonstrated that the psycho-diagnostics methods used are reliable and their predictive ability is very high.

3. Control room operator training on "management skills"

The necessity to add to the existing training of NPP personnel also training dealing with the "soft skills" emerged in the Slovak Republic after the accident at the NNP Chernobyl. Nevertheless no systematic analyses for these needs were done at that moment. Later, in the 1995, two independent activities, which led to the soft skills addressing in training, started.

The first activity was connected with the IAEA TC Project on Implementation of SAT for NPP Personnel Training. This project was implemented from 1995 to 1998. In the frame of the project, SAT was used for upgrading of training for 7 job positions – turbine operator, reactor operator, chemistry foreman, health physics foreman, reactor maintenance worker, pump maintenance worker and electrical maintenance worker. In the analyses phase, except the others, there were also identified needs for the training on the "soft skills" which were not included in the existing training.

The second activity was connected with the NPP Bohunice project on the analyses of the training needs for "managerial skills" of line managers, foremen, and shift supervisors.

On the bases of the above mentioned analyses new training addressing "management skills" was established. In this training, communication, stress management, time management, leadership, teamwork and conflict management topics are addressed. Other topics of "soft skills" such as safety aspects (nuclear, industrial safety, technical) and safety culture had been addressed in the original training.

In the following part there is described the module called "management skills" of the initial classroom training for control room operators. The other training that addresses these skills are — initial simulator training (namely teamwork, leadership, stress management), initial on the job training, classroom retraining of the management skills and simulator retraining.

The aim of the initial classroom training is to:

* upgrade the social-psychological level of control room operators
* stimulate development of individual abilities in this area and to optimise the usage of these abilities in their profession

* train staff to be able to cope with stress in emergency situations
* increase motivation and to upgrade teamwork

4. TRAINING TOPICS

4.1 Communication

Effective, exact and correct exchange of information inside a team, between individuals, between individual and groups or between groups, represents one of the basic tool for meeting goals, for fulfilment of interests, and accomplishment of tasks. Functionality of a company is proportional to the quality of communication and communicational channels.

Learning objectives

After the completion of the lesson the trainee will be able to:

* explain the operator's communication role in working task
* demonstrate communication techniques

Content of the topic

1. Nature of the communication process
2. Kinds of communication used in the job
3. Communication failures and their prevention
4. The art of listening
5. Non-verbal communication
6. Assertive communication
7. Communication barriers

Training methods

* presentation
* role-play
* analyses
* feedback and video-feedback

4.2 Leadership

If the team is to be effectively supervised, the supervision should not be reduced only to the ordering and verification of the fulfilment of the orders. It is necessary to combine the needs of the team members and the needs of the company.

Learning objectives

After the completion of the lesson the trainee will be able to:

* list and describe various types of management at NPP
* demonstrate various kinds of management and co-operation techniques
* describe principles of co-operation based on mutual confidence
* assess own abilities
* assess own shortages and support own positive development

Content of the topic

1. Principles of supervision at NPP
2. Types of supervision
3. Strategic supervision
4. New methods and techniques in team supervision in connection with personal, organisational and economical situation at NPP
5. Leader and leader's role
6. Coaching, leadership and supervision
7. Work without fear and open communication
8. Co-worker as an individual and development of personality
9. Information quality
10. Aiming of subordinates, their support and evaluation
11. Delegating
12. Motivation

Training methods

* presentation
* role-play
* individual and teamwork
* case studies

4.3 Conflict management

Conflict is a collision of opposite behavior , feelings, aims, needs and believes. If the conflict is not solved, it represents threats for tasks, objectives and aims of the company.

Learning objectives

After the completion of the lesson the trainee will be able to:

* determine the core of conflicts and identify kinds and symptoms of conflict behavior
* identify possible sources of conflicts in a company
* demonstrate strategies for conflict management

Content of the topic

1. Sources of conflicts
2. Models of conflicts
3. Methods for conflict management
4. Rules of behavior during the conflict
5. Conflicts in teams
6. Assertiveness

Training methods

* conflict modelling
* dramatic techniques
* assertive techniques
* feedback

4.4 Team management

The need for teamwork is based on the necessity to solve problems in the control which requires the multidisciplinary access. This access provides new solutions, and increased motivation while looking for solutions and during their implementation. Synergy effect of a team provides a new quality to the problem resolution.

Learning objectives

* to discuss the goals and tasks of a team and adhere to these tasks and goals
* to associate oneself with tasks
* to demonstrate co-operation with others based on mutual confidence
* enforce goals of teamwork
* to explain methods and to demonstrate techniques of teamwork
* to bear responsibility for goals and tasks

Content of the topic

1. A team at the NPP as a part of the organizational unit
2. Advantages and disadvantages of teamwork
3. Methods of teamwork
4. Acceptance and mutual confidence
5. Team supervision methods
6. Team motivation
7. Creativity and teamwork
8. Experience exchange and continuous improvement
9. Team and conflict
10. Team roles

Training methods

* workshop
* short presentation
* discussion
* case studies
* role-play

Annex Q

RUSSIAN FEDERATION, SMOLENSK TRAINING CENTRE: PROGRAMME OF PERSONNEL TRAINING IN THE AREA OF HUMAN FACTORS

1. INTRODUCTION

The task of Russian NPP personnel training is being implemented by NPP Training Centres, i.e. Novovoronezh for VVERs and Smolensk for RBMKs. Until recently, NPP personnel training has been perceived as teaching knowledge and skills in technical areas. Recently there is another tendency where more importance is being attached to human factors aspects of training (i.e., "soft skills."). At Kalinin NPP, Kursk NPP, Smolensk NPP, NvTC, andSmTC, soft skills training is carried out not only in the frame of refresher training, but also during initial and advanced training. Programme topics touch upon such aspects as team formation, management and leadership on shift, communication, conflict management, self-control and stress management. Programmes are implemented for NPP personnel of various levels. Some programmes were developed with reference to international documents, and transferred to Russia in the framework of international projects.

2. BACKGROUND

The Smolensk Training Centre's main activity is training of RBMK operators. Along with other training aspects, philosophy of training also considers the human factors. The necessity of training on soft skills had been determined while implementing IAEA recommendations which were provided by international experts in training at NPP-RBMK, Russia 1992-93 ("Safety Review of Design and Proposed Actions to Improve Unit3-RBMK, Smolensk NPP"). Interest in the topic was also expressed by MINATOM of Russia and ROSENERGOATOM Concern.

It was an application of SAT (Systematic Approach to Training) that gave a distinct overview of generic personnel training structure which considered all types of staff starting with operators and finishing with top management; that became the unique key approach, which allowed the identification of needed technical competencies as well as soft skills. Additionally, in the framework of the International Project (Transfer of SAT to Training at Russian NPPs) for enhancement of Unit Shift Supervisors' competence) SmTC developed and launched a Review Course called "Influence of Human Factors on NPP Safety," intended for NPP operational personnel.

3. HUMAN FACTORS COURSE

The content of the course includes the following topics:

Session 1 - Human factors and nuclear safety. Significance of personnel for safe operation of the plant is observed in lectures and during group discussions. Administrative problems between management and personnel, man-machine interface aspects, and ergonomic requirements of the work environment are also included into the topic.

Session 2 – Human errors and reliability. Basic operator's characteristics. External and internal factors of human behavior. The session is devoted to the review of personnel errors, strong and weak points of an individual at work, methods to reduce the number of errors.

Session 3 – Personality influences on behavior and decisions. The personality of an efficient operator is characterized by such features as responsibility, sociability, and self-control. The development of the above features and their significance for operational work are discussed during practical sessions.

Session 4 - Stress factors. Stress symptoms. **Behavior under stress**. **Strategies for stress management**. Chronic stress at work is a cause of fatigue, sickness, and decrease in personnel performance. At sessions, operators are given appropriate information on how to react to such symptoms and what preventive measures should be taken to avoid stress.

Session 5 –Conflict management. On the basis of practical examples, operational personnel are trained to analyze conflict causes, identify conflict contributors and apply effective strategies to resolve conflicts in production environment.

Session 6 – Teamwork. In order to choose an effective behavior it is important to know the mechanism of processes which take place in a group. Video training is used at practical sessions to demonstrate negative and positive aspects of these processes and methods to control them.

The programme's content and session's duration vary depending upon the composition of a trainee group. A review course based on topics 1–4 (4 hours) is conducted for shop operators (reactor, electrical, chemical, and turbine shops). For Control Room operators, a complete course based on practical sessions (4–8 hours per each topic) is conducted.

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Annex R
EXPERIENCE OF OPERATIONAL PERSONNEL SUPPORT PROGRAM AT RUSSIAN NPPs

1. INTRODUCTION

Problems related to human factors impact on personnel performance at Russian NPPs are a matter of concern of psycho-physiological laboratories (PPL). The PPL scope of tasks includes ensuring the reliable performance of NPP staff. The concept of the word 'reliable' implies such factors as motivation, psychological preparedness of a person to correct actions, and psycho-physiological state. PPLs conduct psycho-physiological check-ups of safety significant NPP personnel.

2. SELECTION THROUGH ASSESSMENT OF OPERATIONAL PERSONNEL FOR RUSSIAN NPPS

2.1. Background

The Chernobyl accident demonstrated that in industrial (including nuclear) incidents associated with hazardous technologies the role of personnel is critical. At Chernobyl, 1986 psycho-physiological check-ups of personnel who took part in the elimination of the accident consequences were carried out. The check-up was made according to the methods developed by the USSR Institute of Biophysics and later on it became a basis for organization of professional selection of NPP operational personnel.

Since 1989, psycho-physiological assessments of NPP personnel have been carried out at the Smolensk Training Centre on a regular basis for employment, during annual medical examinations, job training, and as part of the study of NPP incidents. Starting in 1997 these assessments have been conducted by the PPL of the Smolensk NPP. Candidates for safety significant job positions at NPPs go through initial and periodical medical examinations and psycho-physiological assessments in the course of their professional career.

2.2. Objectives

The objectives of these personnel assessments are to:

* Ensure reliable personnel performance in conditions of increased working load (tense emotional and stressful situations, work on shifts, safety responsibility, etc.
* Maintain performance efficiency during working periods.

2.3. Types of assessment

Initial (employment) assessments identify candidates who have medical and psychological contra-indications for operational work. Periodic diagnostics are aimed at:

* evaluation of personal and motivational features of personnel who maintain safety adherence;
* analysis of physiological process dynamics and physiological state of personnel;
* definition of interpersonal characteristics (ability to communicate with team members on shift).

Other types of assessments identify deviations of the psycho-emotional state of an operator as well as his/her level of performance and ability to carry on a professional career. Investigation is focused upon identification of the level of intellectual and physiological development, which manages operator's effectiveness i.e. memory, attention, ability to resolve logical tasks, velocity of perception and estimation of information. These assessments identify personal characteristics of an employee – motivation, responsibility, ability to control own behavior , and inclination to take reasonable decisions (as well as deviations in the psychological status of a person which define the boundary between norm and pathology).

Professional psycho-physiological investigation identifies the actual state of basic characteristics that are important for operational function of an organism (i.e. nervous and cardiovascular systems and also determines whether there are contra-indications for an operator to maintain his/her job permit). Absence of medical and psycho-physiological contra-indications is one of compulsory conditions to get Gosatomnadsor's license for certain types of activities in the nuclear field.

2.5. Conduct of assessments

PPLs, which support NPP operational personnel, have specially trained personnel and are equipped with specific equipment to conduct these assessments. A psychologist, physiologist, functional diagnostics physicist and psychiatrist carry out the assessments. Tests and specially developed hardware and software are used, which apply statistical analysis of data and give an individual forecast of an employee's reliability.

Based upon assessment results, specialists make conclusions concerning an employee's aptitude for specific types of jobs and whether it would be necessary to implement additional actions (rehabilitation, training, additional medical check-up) which would enhance adaptation of the employee and his/her performance.

3. REHABILITATION PROGRAM & HUMAN FACTOR TRAINING

The tasks of PPLs are not limited to identification of deviations in employee's functional state. According to the results of assessments, they select personnel who need special training for rehabilitation of their capacity for work. Rehabilitation is the second most significant of PPL activities for human factor management at Russian NPPs (after professional selection.)

On the whole, rehabilitation courses are aimed at training of psychological self-regulation methods and clearance of stress. The following are examples of how the various PPLs and training centres implement their rehabilitation and training programmes:

2.1. Novovoronezh Training Centre

Psychologists of the Novovoronezh Training Centre (NTC) provide training on how to clear stress, decrease physiological loss of activity and enhance reliability of personnel. Training sessions are conducted for Shift Supervisors of Station Departments. The content of training sessions includes an explanation of what stress is and build-up of self-regulation and auto-training skills. To apply skills learned during training for further application in the real life; they use the «Freeze Frame» method. Monitoring of an individual's state during training

sessions is done by means of specific psycho-physiological hardware. They use methods such as cardial rhythm registration, electrocardiogram, encephalogram, and Halter's monitoring,. These parameters are checked at the beginning of, in the middle of and at the exit from a relaxation session. Apart from this anti-stress Program, the NTC conducts training on safety culture and conflict resolution. They have also developed a method for analysis of errors that occur during training.

3.2. Smolensk NPP

In the framework of rehabilitation program activities, a training course on psychological self-regulation has been developed and is currently conducted. The duration of the course is 13 hours, which includes theoretical and practical training sessions. The training sessions are conducted by SNPP operational personnel in-groups and individually.

* The first stage of the course is composed of sessions 1 – 5. It is aimed at build-up of initial skills of self-regulation and self-influence directed to emotional and vegetative sphere.

* The second stage – sessions 6 – 9, is aimed at basic psychological self-regulation exercises and strengthening of emotional and volitional sphere.

* The third stage – sessions 10 – 13, is aimed at improvement of acquired skills of self-regulation and build-up of emotional set off in extreme situations.

For administrative personnel, SNPP organized a training course entitled Modern Approach to Communication Psychology. The course has been developed for heads of shops, deputy heads of shops, foremen and lead specialists of station departments. The duration of the program is 16 hours. It includes lectures, discussions and practical training. Methods of speech analysis, regulation of behavior on levels of conscious and unconscious perception are applied in this course.

3.3. Balakovo NPP

3.3.1. Background

The system of medical and psycho-physiological management, which is currently being used at the Balakovo NPP, includes regularly planned activities aimed at rehabilitation and bringing NPP personnel into a healthy state. 'Rehabilitation and bringing into a healthy state' means a complex of medical and psychological treatment for the support of high level of NPP personnel health and efficiency. The system was established in 1991. It became a logical continuation of an earlier activity in the area of human factor enhancement, and assurance of NPP safety and operational quality.

Specialists of the PPL conduct an annual psycho-physiological assessment of operational personnel. Results of the assessment disclose different parameters of employees which indicate various types of de-adaptation (or high probability of its initiation) signs of fatigue and increased anxiety, and low self-esteem problems.

3.3.2. Objectives

The objective of PPL specialists is to ensure efficient and reliable operation of Balakovo NPP personnel. In the work process they resolve the following tasks:

* Reduction of time needed for adaptation and further involvement into the process of labour.
* Long-continued and stable support of high level of efficiency during a shift.
* Prophylactics of nervous and psychological stress.
* Optimization of teamwork.
* Restoration of general and professional efficiency.

Restoration is applied to operational and maintenance personnel either if recommended by line management or on the basis of assessment results. In addition, special groups are formed for those who have cardiovascular problems and for Chernobyl accident salvage crew members.

3.3.3. Methods

In the course of year 22–23 groups, of 25 persons each, undergo such treatment. The Rehabilitation methods are:

* Individual and group psychotherapy.
* Individual psychological correction.
* Auto training.
* Massage.
* Medical gymnastics.
* Various kinds of medical treatment.

When identifying their trend of work with personnel, specialists of the Balakovo PPL determine the basic notion of health as full physical, mental and social well being. Well being has been defined as a dynamic status of mind, characterized by physical harmony between abilities, demands and expectations of an employee and other factors, brought in by the environment. Psycho-social stresses arise at work and are associated with excessive requirements or extreme work conditions, etc., that have their influence over a length of time and repeat constantly or often

Application of social-psychological training phenomena improves the ability to adapt to work, chose more effective strategies of behavior, and be better prepared for complications in personal and business relations.

3.3.4. Training

Training touches upon the following subjects:

* Aspects of cognition – receipt of new information about: communication generally, methods of situational analysis, oneself, and psychology.
* Aspects of emotion – experience of new knowledge about: oneself, success, failure and self-estimation.

* Aspects of behavior – from realization of ineffective forms of behavior to adequate forms and their application.

3.3.5. Summary

Activities on rehabilitation and bringing into a healthy state are a constituent part of Balakovo NPP personnel training programmes aimed at assurance of safe operation. The above activities play a positive role in reduction of emergency shutdowns due to personnel error.

3.4. Beloyarsk NPP

3.4.1. Background

The Functional Rehabilitation Centre (FRAL) was created at Beloyarsk NPP in 1993. The practical work of the Centre aims at enhancement of reliability and success of professional activity of different categories of Beloyarsk NPP personnel. Specialists of the Centre state that NPP personnel should have a suitable collection of emotional, volitional, motivational, intellectual and other personal features so that they can promptly and successfully implement regulated functions in various operational modes.

NPP personnel reliability is influenced by:

1. Professional competence (knowledge, abilities, skills);
2. Functional status (health, fatigue, memory, attention, etc.);
3. Personal psychological features (conscientiousness, discipline, etc.), Social-psychological climate at shift (co-operation, presence/absence of conflicts, etc.);
4. Social conditions

3.4.2. Function/tasks

The tasks of the rehabilitation centre FRAL are:

(1) Realisation of complex activities aimed at recovery of operational personnel and other employees of the BNPP to support their optimum functioning.
(2) Realization of individual rehabilitation sessions on practical psychology and self-regulation for BNPP staff in accordance with psycho-physiological diagnostics and medical recommendation.

The complex of recovery activities includes classes on psychology, psycho-technical exercises, prophylactic medical treatment and some methods of nontraditional medicine aimed at the support of good health and professional efficiency of NPP operational personnel.

According to results of an annual psycho-psychological check-up of personnel which is carried out to monitor the dynamics of professionally important features, specialists of FRAL identify a risk group. A risk group is formed by individuals with a lower level of professional aptitude. Their psycho-physiological parameters indicate different states of de-adaptation or high probability of its initiation, which is entailed by signs of emotional tension, fatigue, increased anxiety, etc. The tasks of the Rehabilitation Centre are carried out by a specialized group of BNPP experts, i.e. psychologists, doctors, masseuses and others.

Annex S

METHODS AND PROCEDURES OF ENTRY PROFESSIONAL SELECTION FOR UKRAINIAN NPP OPERATIONAL PERSONNEL

1. PROGRAMME OF PSYCHOLOGICAL AND PSYCHO-PHYSIOLOGICAL TESTING OF APPLICANTS FOR NPP OPERATIONAL POSITIONS

1.1. Background

A programme of psychological and psycho-physiological testing of applicants for NPP operational positions was developed on the basis of a government order. In this Programme psychological and psycho-physiological peculiarities of person are considered both in the framework of medical testing as indicators of state and resources of psychological health, and in the framework of professional selection as professionally-important psycho-physiological features of operators.

1.2. Tasks of the programme of psychological and psycho-physiological testing

The tasks of the programme are as follows:

* to investigate the structural-personal peculiarities of the applicant in the frame of assessment of state and resources of psychological health, prognosis for effectiveness of decision-making and actions in emergency situation
* to assess a state of psychological peculiarities of a person in the frame of assessment of state of psychological health, its resources and stress stability
* to assess a degree of satisfaction with factors of macro- and micro-social environment as a social-psychological subsystem of adaptation system of human psyche
* to assess a state of professionally-important psycho-physiological features of a person in the frame of prognosis for effectiveness of decision-making and actions in emergency situations
* to formulate a conclusion on the state of psychological health and professionally-important features of operators in accordance with results of psychological and psycho-physiological testing.

The Programme of psychological and psycho-physiological testing includes a number of reliable testing methods intended to diagnose: latent forms of psychological diseases, psychological disorders, anomaly development of personality, peculiarities of personality structure (character, temperament, behavior), adaptation abilities of individuals, peculiarities of attention (stability, switching, concentration), peculiarities of operative and short-term memory, peculiarity of complex sensor-motional reaction, stress stability, ability to make a decision and act in emergency situation, and mental capability to work in conditions of intellectual pressure and monotony.

1.3. Entry/transfer procedure of psychological and psycho-physiological testing of applicant for an operator position (illustrated by Zaporozhye NPP)

An applicant for an operator position is directed to psycho-physiological testing by the Department of Human Recourses of the ZNPP. Entry psychological and psycho-physiological testing for operative positions is carried out daily on the premises of the Laboratory for Psycho-Physiological Testing of the Socio-Psychological Division.

Upon finishing the testing, the psychological characteristics (except clinical and patho-psychological results) are displayed on a computer screen. Every tested person receives these characteristics, brief oral consultation and if necessary total consultation with recommendations on rehabilitation and psycho-prophylactic measures.

Complete results of psycho-physiological testing are submitted to the Division of Professional Testing of the Special Medical-Sanitary Department, which makes a decision on the suitability of the candidate to perform operative job at the NPP.

2. METHODS USED IN THE PROGRAMME OF PSYCHOLOGICAL AND PSYCHO-PHYSIOLOGICAL TESTING

The psychological and psycho-physiological testing programme is a set of methods combined on the principles of mutual supplement, confirmation and clarification of psycho-diagnosis indicators.

The programme includes the methods as following:

- Standardized multi-factors method of person investigation SMFMPI (566 statements);
- Schmieschek person questionnaire;
- Projective method «house-tree-man»;
- Shulte-Platonov table;
- Proof test (Landolt rings);
- Digital test on operative memory;
- Digital test on short-term memory;
- Complex sensor–motional reaction.

Annex T

GUANGDONG DA YA BAY NUCLEAR POWER PLANT
TRAINING POLICY

1. PURPOSE:

The training policy of Guangdong Nuclear Power Station (GNPS) aims to ensure that all staff is well trained by using various means to obtain and maintain the necessary competencies for the safe, efficient and economic operation of the plant.

2. SCOPE:

This policy is based on the company policy and is applicable to:

* All GNPS staff for any position and grade.
* The whole process for training, qualification and authorization.
* Operator licensing and specific skills certification.
* Pre-qualification of contractor staff.

The authorization mainly concerns nuclear safety, industrial safety, radioprotection and specific work (such as nuclear fuel handling).

3. RESPONSIBILITIES:

3.1. Department manager

* has the overall responsibility for the training, qualification and authorization of the department staff.
* is responsible to provide sufficient resources and means to ensure effective implementation of the training program.
* is responsible for approving the authorization of department staff in accordance with ATR.

Remark: The authorization of Department Managers and Deputies is subject to the approval of General Management.

3.2. Deputy manager in charge of training

* authorized by the manager, is responsible for signing authorization sheets for the department staff.
* assisted by the PTC, is responsible to promote and coordinate the proper implementation of this training policy within the department.

3.2. Plant training committee (PTC)

The committee is responsible for the following functions:

* developing the training policy.
* determining and adjusting the training orientation.
* design and review of the plant authorization training requirement (ATR).
* review of the individual training program for GNPS staff.
* developing mid term and long term training plan.
* developing strategies for staff career enhancement training (CET).

3.4. Branch Head

With assistance of the plant training center (OTC), is responsible for the training, qualification and career enhancement of his staff through the establishment and implementation of individual training programs and nominating his staff for authorization.

3.5. Training Centre Head

* is responsible for the implementation of theory training, competence training, simulator training and management training within the OTC.
* supervises all branches on the job training and carries out new employee pre-job training.
* trains and selects control room operators by examination. Expertise maintenance staff skills.
* assists departments and branches to define the qualification and authorization requirements for their staff as well as contractors.
* reviews the implementation of training program and reporting the results to PTC.

3.6. Training Engineer

Authorized by his Branch Head or Section Head, is responsible to organize and coordinate the analysis of training demand and making plan within the branch and section, as well as to implement on the job training.

3.7. Staff

Each individual is responsible to attend training as scheduled and to obtain the necessary skills, knowledge and abilities to perform his assigned job.
each individual has the responsibility to train other staff.

4. PROVISIONS

4.1. Target

The purpose of formulating and implementing the training policy is to achieve 3 targets:

* To ensure the plant staff is authorized.
* Through attending necessary and effective training courses, all GNPS staff shall obtain authorization that is commensurate with their assigned positions in line with the relevant regulations.
* To ensure the plant staff is qualified.

Through skills training, all GNPS staff shall have the necessary qualification to perform their tasks according to the duty specifications.

To ensure the plant staff have career enhancement

Continuing training, as an important means for the development of human resources, will enhance the knowledge and competencies of the plant staff to promote their professional career.

4.2. Principle

* Authorization is a prerequisite for taking a position.
* To ensure the safe and economic operation of the plant, all staff shall be well trained, qualified and as necessary authorized before performing their duties.
* Providing all staff with training.
* The regulations concerning authorization and qualification management are applicable to all GNPS staff, and not relevant to their position and grade.

* Full career education.
* The authorization must be periodically renewed or else eliminated when necessary. It demands training and retraining time during one's entire career in order to maintain and renew knowledge and skill for the job.

4.3. Training strategy

4.3.1. Systematic approach to training

* Constructing properly training management system with reference to SAT.
* Establishing practical training management procedures to guide the training work.
* Setting a full-scope training system composed of the PTC, OTC and all branch-training managers.
* Making the whole training process trackable to achieve quality assurance.

4.3.2. Training demand analysis

* The PTC defines the authorization training requirement (ATR) according to the regulatory requirements and lists the compulsory training courses required for authorization for assigned positions.
* Gradually introducing the job task analysis method to define training demands for qualification.
* Defining requirements for skill training in line with job specifications through interview with trainees.

4.3.3. Training course design

* Defining authorization related courses and laying down the relevant requirements in conformity to the standards.
* Describing requirements for skill training on the basis of the defined training demands.
* Designing the Position Qualification Training Requirement (PQTR) for each position.
* Developing the Individual Training Program (ITP) for GNPS personnel in line with ATR and PQTR.
* Working out training implementation schedule on the basis of ITP.

4.3.4. Preparation for training

* Budget should be prepared and reviewed for those training items which necessitate internal and external supports.
* Provide necessary training facilities, e.g. full-scope simulator, laboratories, classrooms and any other teaching aid.
* Mobilize qualified instructors including full-time and part-time ones, as well as those invited from outside.
* Create an experience feedback system. Incorporate management and technical information on the site or from national and international power plants into training materials in a timely manner.
* Draw up teaching plan, compiling teaching materials and reference documents, defining examination mode.

4.3.5. Training execution

* OTC should have a comprehensive training management system and properly organized theory-training courses.
* Ensure the simulator training quality for operators licensing with satisfactory instructor resources.

* Maintain the simulator software, hardware and instrumentation.
* Initiate skill-training courses by use of all resources both in OTC and on the site.
* Organize external training activities in a planned way.
* Establish a system of orientation education, training before taking position and appraisal for new employees
* Encourage on the job training and shadow training in a diversified way within the departments.

4.3.6. Training results evaluation

* Establish a supervision system for on the job training to follow-up, evaluate and assist the process of on-the-job training carried out by all branches.
* Audit the training program periodically (by the Quality Assurance Dept.).
* Create training document management system and keeping integrally training file.
* Provide timely communication and feedback concerning training work through PTC.

5. RECORD

* Authorization sheet, individual training programs, training evaluation sheet and qualification sheet are formal certificate for GNPS personnel authorization and qualification. OTC must store these files integrally.
* The form of records should be defined in the implementing procedure and the relevant technical specification.

6. DEFINITIONS AND ABBREVIATIONS

6.1. Definitions

Systematic approach to training

* A logical progression from the identification of the competencies required to perform a job, to the development and implementation of training to achieve these competencies, and subsequent assessment of this training.
* Training demands analysis, training course design, preparation, implementation and assessment are fundamental processes of SAT.

Authorization

* The granting of a written permission by the responsible manager or his representative to perform the duties and responsibilities of a position in a designated period based on demonstrated competence, and safety and quality awareness.

Licensing (and/or certification)

* The issuing of written permission by the state or local regulatory body to an individual to certify his competence and allow his to perform specific activities related to the operation of a nuclear power plant.

Qualification

* An overall evaluation on the education background, technical competency, management skill and health of the staff. This evaluation is made on the combination of education, training and experience required to meet specified job performance criteria.

Training for assigned position

* To be trained for specific skill required for the assigned position through classroom practical and/or external training.

Management training

* Courses to learn modern management ideas and skills for managers of various grades.

Equivalent accreditation

* The staff has the same knowledge and competencies by education, training or experience before the designated authorization and qualification training. The training manager can excuse him from the courses after accreditation.

6.2. Abbreviations

PTC:	The plant training committee
OTC:	The plant training center
SAT:	The systematic approach to training
JTAJT	Job task analyses
ITP:	Individual training program
ATR:	Authorization training requirement
PQTR:	Position qualification training requirement
CET:	Career enhancement training
OJT:	On the job training

7. REFERENCE DOCUMENTS

* CP/08/002, Human Resources Management — Company Policy Manual
* HAF0301, Staffing of nuclear power plants and the recruitment, training and authorization of operation personnel – Regulations on the nuclear safety of The People's Republic of CHINA
* Final Safety Analysis Report (FSAR) of the Daya Bay NPP, Chapter 13
* INTERNATIONAL ATOMIC ENERGY AGENCY, Nuclear Power Plant Personnel Training and its Evaluation – A Guidebook, Technical Reports Series No.380, IAEA, Vienna (1996).

Annex U

COMMERCIAL AWARENESS TRAINING IN BRITISH ENERGY (Formerly Nuclear Electric plc)

1. Background to need

Nuclear Electric plc was formed in 1990 as a result of the privatization of the Central Electricity Generating Board (CEGB). At the same time the UK open Electricity Market, the "pool", was formed. As a result, although still state owned, Nuclear Electric (NE) was forced to operate in a commercial market, competing against private generators. Also at this time, unlike the other privatized generating companies, Nuclear Electric was not allowed to sell electricity directly to customers. It was only allowed to generate its income by selling directly into the Pool.

Nuclear Electric also inherited the financial liability for decommissioning all ex CEGB Nuclear Power Stations, but did not inherit the financial provision that had been made for this. Instead the Government decided to enhance Nuclear Electric's income by a premium payment known as the "nuclear levy". This income was limited to a set output ceiling, which was subsequently reduced year on year and planned to be phased out in 1998.

In summary the company needed to become profitable in a conventional sense, at a time when few, if any, staff in the company had any experience of operating in a fully commercial climate.

A critical success map produced for Nuclear Electric in 1990 identified 3 key goals for the company; profit, credibility and acceptance. Against the area of profit it was determined that a "commercial culture" was required.

2. Implementation approach

Human resources staff, working with colleagues in the newly formed commercial department, determined that a number of steps were required, the first of which was to ensure that all managers had:

- An increased awareness of the whole company – its new business environment, business economics, financial scenario and the necessity to achieve commercial goals.
- A commercial awareness of their own part of the business and how they should contribute to the development of a successful company.

A series of company presentations were conducted, but these did not appear to be overcoming the problem. At the same time a number of external commercial training courses/programmes were being explored, both traditional and open learning. It soon became evident that the Company's unique commercial arrangements were not addresses in any available training. During the course of this work the company made contact with a company called Business Training Systems (BTS) who specialised in bespoke commercially realistic business simulations, combined with input modules.

In 1991 BTS were asked to carry out a pilot study which involved them conducting training needs analysis (TNA) interviews with 17 Directors and Senior managers. These interviews covered their views on the following topics:

- The most important business issues in NE now and in the future,
- The most important factors for improved business performance and profitability in NE,
- Who they consider would benefit from a development programme, and
- Which topics it would be essential to focus on, in order to increase commercial awareness in NE.

On the basis of this work a programme was developed, initially for the top 200-300 managers in the company, although this was subsequently extended, to provide a better understanding of how staff could contribute to NE's success.

2.1. Design and development

From the point of agreement BTS staff worked closely with NE for 2 months to design the simulation and the programme. The objective was not to build a replica, but a realistic model of the way NE operated in the new electricity market. It was essential that participants should be able to relate to the model, without it being so complex it would take an undue amount of time to learn how it worked, and dilute the important learning points.

The necessary information was gathered through interviews and regular contact with company directors, senior managers and staff from different parts of the company. This early involvement of managers helped to create ownership of the workshop and ensure cohesion with corporate objectives.

2.2. Workshop content

The approach was to generate acceptance, commitment and learning points through a combination of:

- Tailor-made computer based business simulation
- Feedback sessions
- Know-how sessions
- Consulting in groups
- Application session

Business simulation

Workshop participants was divided into 5 management teams, each of whom took over a Nuclear Generating Company with full responsibility for running it for 5 years. The simulation was dynamic and realistic; everything that could happen in real life could happen in the simulation. The results of the management teams' decisions were dependant on competitors' actions, general development of the business environment and the market, as well as unplanned incidents in their own company. The simulation worked as a catalyst in the learning process.

Feedback sessions

At the end of each "year" the results for each company were fed back to all the groups. This provided an opportunity for the participants to see the effects and consequences of the decisions they and other teams had made. As the teams were ranked on their performance, the friendly competition was found to help motivation.

Know-how session

During these sessions the participants took a step back from the simulation to look at important issues within the company. These sessions highlighted the parallels between the simulation and Nuclear Electric. In this way the participants were focused on the learning points to help them succeed in the simulation. Areas that were covered included:

- Ways of improving profitability in the company
- Basic business finance
- The electricity market (presentation by a member of the company's Trading Department)
- Investment strategy in Nuclear Electric (presented by staff member)

Consulting

During the decision rounds of the simulation the trainers supported the groups and helped them analyze the consequences of different decision options. It also gave a further opportunity to ensure everyone picked up the important learning points.

Application session

This was the final, and probably most important, stage of the workshop. Each team was asked to present the major learning points they had gained from the workshop to a senior company manager. They were also required to transform those learning points into individual action plans, which they were committed to implementing when they returned to the workplace, in order to improve the company's performance. A copy of these action plans was subsequently sent to their line manager for follow-up.

3. Results

The results of the programmes need to be considered at two levels; that of individual behavior/performance and business "bottom line" results. The programmes were evaluated and followed up in three ways:

- Evaluation questionnaires were completed by participants at the end of each programme, to ensure the correct messages had been received, and to continuously update the programme.
- Individual action plans were followed up through the chain of line management.

- The overall effect of the programme was evaluated using questionnaires sent to participants 3–6 months after completion of the programme. This follow-up questionnaire included a request for specific examples of cost saving made as a result of the learning gained on the programme.

In terms of tangible business results, some £13 million of initial cost savings were identified by staff who returned their 3–6 month questionnaires. It is felt that the actual cost saving over time by programme participants was significantly greater than this figure.

At an **individual/behavioral** level the programme helped to clarify the need for the change that was taking place in the company and a clear understanding of the importance of costs and cost reduction. Examples of actual feedback from participants included: "Easier acceptance of the [company's] vision targets" and " [it gave me] understanding of the extent to which every amount saved (however small) contributes to the company's success". It also gave staff a much better understanding of how competition in the marketplace was affecting Nuclear Electric.

It was clear to senior management that this programme contributed to a major shift in the commercial culture of the company. This was demonstrated by the fact that, despite the cost of the programme, it was decided to roll the programme out right across the company. This required the creation of an additional power station business unit model. As a result approximately 2000 staff in the company (out of a total of ~ 9500) eventually attended the programme.

4. Lessons learned

With the benefit of hindsight it is likely that the company would have taken the strategic decision to deploy the programme to a wider audience in the first place, which would have saved time and cost in its development. Notwithstanding this, the programme was deemed to be very successful and indeed won a National Training Award in the United Kingdom for its proven success in benefiting both individuals and the company as a whole.

A programme of this nature could be designed for any utility going through this kind of commercialization, even if only because it is required to make a better return on investment in a state-owned environment.

5. Contact

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Annex V

ACTIVITIES OF THE PAKS NPP RELATED TO HUMAN PERFORMANCE IMPROVEMENTS

Events of recent years and changes of the econo-social environment in the 90s set new expectations for the Paks Nuclear Power Plant Ltd., as an organization, as well. Sensing these factors, in the first half of 1997 analyses were carried out on the internal functions of the organization and on circumstances that affect performance, atmosphere and interpersonal relations. In the second half of the same year, the plant launched a thorough human resource (HR) improvement program. The program covers the following areas:

(1) To establish mutual agreement in the plant
(2) To increase the efficiency of internal communication activities
(3) To provide management theory and techniques courses
(4) To organize rehabilitation programs

To establish the mutual agreement in the plant

The mutual agreement is a written contract form reflecting all rules of mutually expected behavior, attitude between each other (organizational units, managers-subordinates, employees) agreed upon by all participants. The necessity of such an agreement, according to the research in the plant, can be justified because employees working in different posts of the numerous organizational units interpreted behavioral norms in different manner. In order that we could step forward, we had to clarify what the expected norms were and had to ensure that the different parties would interpret these in the same way.

The mutual agreement for the complete organization of the plant was elaborated with active participation from both management and employee sectors, synthesizing proposals from sometimes 1000-1500 people in different phases. As a result of well established opinions and useful proposals, the agreement on rules that apply for behavior and attitude of Paks NPP employees was accomplished, hence allowing a valid mutual agreement which takes the changed econo-social expectations into consideration and based on a broad consensus.

The mutual agreement that came into force covers the following areas:

- Personal wealth
- Private life
- Employment
- Health
- Behavior al culture
- Protection and improvement of company reputation
- Internal communication
- Traditions

The employee's interest and trust in the mutual agreement has been demonstrated in that, to date, around 2/3 of the total, about 1700 people, have signed this agreement.

To increase the efficiency of internal communication activity

In a power plant each change has to be calculated with short and long term investment return. In this present case, at the Paks NPP, the objective is to generate electricity using nuclear technology with the highest possible availability factor, the least number of operational events while maintaining nuclear safety. This objective is not only achievable via provision of technical requirements but also with a more efficient use of the plant's human resources. One significant area of this is internal communication. Communication within the plant, the flow of information is a production factor which, if improved, increases the outputs of the company.
The continuous improvement and organization of the plant's internal communication (information flow and relational systems) is incredibly important in case of a plant with unique technology which, besides the high standards, is always in the center of public interest, for which the Paks NPP is a good example. But what is the current status of internal communications at Paks? What justifies that we should deal with it on a concept level?

Though the information channels are set, many internal problems can be identified. Independent of the post, many complain about slow information flow, temporary blockage, spreading of fake news, leakage of confidentiality, and about lack of trust and willingness to cooperate which are decisive factors of the communicative relations. Partly these factors explain that many people question the **authenticity** of the official news.

A **disproportion** can be experienced also in the information flow and the communicative relations. For information related to work performance all have access but this is not always the case for questions of existence or future. Similar disproportion can be witnessed between written and oral systems. The oral forms that step over organizational hierarchy, allowing for direct communication — for which there is a strong need anyway — are being pushed back lately. This consequently results in a **shortage on the supply side, and as there is a demand, "someone" shall play the provider function anyhow**.

Our concept of internal communication intends to introduce a common framework that for the long term incorporates the individual elements, the existing and future channels and forms, and tries to handle this far-reaching and delicate flow system.

The problem of internal communication cannot simply be solved by the job-incumbents themselves, but there is a need for cooperation and will from others as well. Therefore, the concept of internal communication is not only a technique but a **view** also, a view that needs to be known and applied by each competent person.

The basic objectives of extending corporate internal communication:

- By establishing or improving internal communication channels and possibilities, to better inform the employees, to reinforce co-operation, co-thinking and continuous discussion in order to ensure the efficient operation of the plant and to achieve and maintain extraordinary results for the long term.
- Presentation of background and causes of managerial decisions in time and in sufficient detail to employees to reinforce acceptance of authenticity, authority and managerial capabilities.

- Extension of possibilities to harmonize employee ideas, opinions and proposals and to forward them to management in order to increase corporate power, the feeling of identity and cogency of management decisions.
- Establishment and maintenance of conditions for frank exchange of views, to minimize unnecessary tensions, in order to establish and maintain a calmer atmosphere, higher spirits, and long term peace in work.
- Increasing employee's state of acquaintance, loyalty and commitment in order to improve efficiency of external PR activities and to accurately fashion and aid the future-forming relation between the corporation and its environment via employee mediation.

Work areas of internal communication

(a) Basic documents of work performance (regulations, procedures, rules, job-descriptions):

These basically are not internal communication documents, however they have a decisive impact on communication. All written regulations, procedures or codes required for the operation of the corporation must be tied to operative processes, as well as their harmonization reinforced and yet uncovered areas searched for. Clarity and manageability of the control system is to be increased. Major emphasis is to be placed on each employee knowing what his/her own task is and to ensure that job-descriptions comply with the regulations.

(b) Meetings

The objective of meetings — except those focusing on specific problems — is to distribute information. The meeting system of the corporation is to be examined down as far as the section level, with the scope extended also to participants. In order to ensure the clarity of the meeting system it should visually be shown (system chart) which is to be introduced as an appendix to the Code of Organization and Operation. A fixed and clear meeting system would aid top management in their efforts to trace information paths, as well as to run random, targeted checks. Meeting chairmen have increased responsibility for the efficiency of the communication and for the speed of info flow. For these chairpersons, training with this type of feature can also be provided. We should strive that in periodic meetings, from time to time, top level managers would personally participate and inform on current important issues.

(c) Daily work contact between managers and subordinates

This is a communication channel of the largest impact — independent of whether we consider top-to-bottom or bottom-to-top direction of information flow — the operation of which requires application of state of the art, human-centered management principles and honesty. For middle and top management, requirements regarding internal communication should be part of their job descriptions. With training and personal attention we should ensure that managers understand and accept that time and efforts invested in internal communication have paybacks in increased work efficiency and quality.

(d) Forums, direct communication possibilities

The number of forums must be raised as they are opportunities for direct communication. From division heads and above it could be part of the job-specific

requirements to organize and run forums. The communication “gap” between superiors and subordinates we experience can be wiped out through improvement of the daily manager-employee contact and the proper use of forums. Channels circumventing hierarchy levels (e.g. poll box, voice mail, INTRANET open page etc.) must be created or reintroduced. Manager visits within the workplaces must also be used for the mutual exchange of information.

(e) Media

Plant newspaper:

The plant’s newspaper layout and personal voice need to be reinforced (besides common info and hot issues, incidence of personal introductions should be raised)

Intranet:

Plant management must pay considerable attention that they are the first to distribute news on events, facts subject to common interest in connection with the corporation or the employees, in order to prevent generation of ambiguous information. The corporate computer network could help a lot in this regard.

(f) Programs, events:

For middle- and top managers participation in corporate programs (e.g. Labor Day Party, Sports Day, Industry Day etc.), more frequent encounters with the employees and the improvement of communication are necessary.

(g) Other communication possibilities (employee organizations):

In this area, striving for authenticity and cooperation in the provision and distribution of information is very important.

Feedback and check:

The current status or improvement of internal communication is to be checked upon not only continuously but also with representative periodic examinations. For this, contracted experts can be employed. For this checkup, a wide spectrum of methods (e.g. direct polling, questionnaires, news spreading speed check) can be used. Plant management should at least once a year discuss the actual status of internal communication, the results achieved, and the preparation and execution of improvement program plans.

To provide management theory and techniques course

Our course is a program constituting 10 presentations, the topics of which were compiled based on real needs derived from discussions with plant management. Processing of each individual topic was done in two phases each time: phase 1 was an hour long presentation delivered by an acknowledged expert in the given field. These presentations were open to any persons interested. Further processing of the topic continued after the presentation, in a seminar format. Members of the seminar teams received the outline of the presentation and other documentation aiding further work. Participation in the presentations — considering the topics, the practical and transferable knowledge included — was advised to

all managers who could transfer the knowledge they acquired consulting with their subordinates playing managerial roles in their respective organizational units, while for the selected managers (about 30 people) participation in the consultation (and consequently in the preceding presentations) was mandatory.

Management theory presentation topics were:

- Introduction to management science
- Management tasks and roles
- Management power, influence and style
- Management strategies and methods
- Management performance and efficiency (through an example)
- Management decisions
- Managerial time management
- Managerial stress and methods to cope with it
- Manager careers, lifecycle
- Unity and totality of management and organization

To organize rehabilitation programmes

The nuclear power plant is a hazardous industry. To safely operate it requires qualified and motivated personnel. The importance of these factors led plant management in 1996 to mandate a rehabilitation, recreation program. The contents of the program were established through pilot testing. Success of these pilot tests is evidenced as since then, only slight amendments proved to be necessary.

The main elements of the program:

- Medical examination
- Gymnastics, physiotherapy
- Relaxation
- Exercises

So far, 992 people have joined the program in 62 sessions.

At the beginning, the referrals were licensed control room staff working shift work. The program was then extended according to blue collar workers in radiation hazardous posts, as well as with middle-level managers who had been working under excessive stress during outages.

Major experiences of the program were:

- According to the individual polls the participants' general state of health improved.
- Analysis of sick leave days showed that the absence rate of participants owing to sickness is better than of others.
- The programme was evaluated, by the participants, to be the most important investment of the corporation, and its continuation was requested.
- Mixing the original relaxation program with the gym, physiotherapy and condition monitoring elements proved to work out well.

- Trainers – psychiatrist, physiotherapist – were judged in a positive way for being at the top of their respective fields of expertise and for their commitment.
- Aversion of participants to psychiatrists disappeared.
- Participants consider the acquired “knowledge” good to build into their daily lives.

Phase one of the rehabilitation programmes is being closed in 2000, it is going to be followed by sending the control room staff again to a program with updated contents – at a higher level.

Annex W

INCREASING AWARENESS OF HUMAN FACTORS IN NPP VIA PSYCHOLOGICALLY BASED TRAINING METHODOLOGIES

It is a generally accepted that the human factors play a very important role in nuclear safety. This conclusion is supported by not only theoretical and scientific arguments but many unexpected incidents and some fatalities, happened within the nuclear industry during the last decades. Case studies based upon some internationally well-known nuclear power accidents unfortunately have provided additional convincing evidence for it.

The policy of both the national safety regulatory bodies and also the international professional organizations in the field of nuclear industry can be characterized with a strong intention to disseminate guidelines and methods for applying Human Factors-centred approach in the fields of design, operation and maintenance. Moreover there is a wide range of professional literature on Human Factors which is relevant to the process industry and there are easily accessible special issues presenting internationally accepted 'good practices' have been collected from the NPPs from all over the world. International regulatory bodies during the regular supervisions of nuclear power plants strive to extend their control mission to not only the technological, but also the organizational and human aspects of safe operation of the plant.

The same is also true in Hungary, of which 40 % of the total energy production originates from the Paks NPP. In spite of the above mentioned facts, however, the Human Factors issues have not been integrated into all the managerial practices of the Paks NPP. At least this is our observation which based upon ten years of consulting and research activities carried out by our research group at the Paks NPP.

In our opinion, the bottleneck of the desired transfer process of Human Factors knowledge and approaches towards the special target groups of NPP employees, (e.g., safety experts, the internal teaching staff, the middle level management, the operating and maintenance personnel) lies mainly in the lack of adequate methodologies which could ensure that the different target groups acquire the concepts of Human Factors and develop and enhance certain skills. Carefully analyzing the organizational behavior of the NPP, a gap can be found between the written rules and the observable leadership routine. The Human Factors related concerns are not transmitted effectively into the daily work behavior . It must be emphasized that a set of detailed and well structured safety regulations does not generate automatically a shared view within the organization about the significant role of Human Factors, furthermore the existence of the up-to-date and well documented safety procedures does not mean that the given organization possess a well developed safety culture.

According to our experiences, one of the promising ways which could lead to the desired change of this situation can be a *comprehensive training programme* accomplished with psychologically based methodologies. In the following short summary we would like to illustrate this opinion presenting some results of our research and development activities carried out at the Paks NPP during the last five years. Experiences to be presented here will be structured in the following way:

Main findings and outcomes of the analysis; Problems to be solved.	*Psychological interventions aiming at improving the safety of NPP through more effective training*

Analysis 1.

A **questionnaire based survey** carried out in 1995 about the **assessment of the 'refresher training' provided for the control room personnel** (N=134)

Table 1.

Main outcomes, problems to be solved	Interventions
Operators require a *real involvement* into the design process of their further training programmes including simulator exercises. Control room personnel expect a *closer connection* between the content of the simulator training sessions and their actual work-related problems, as well as any changes or small modifications to be expected in the control room. High level of *dissatisfaction* with the *pedagogical competence*, and the lack of *empathy* and also the *methodological preparedness* of the internal teaching staff. There is no systematic and comprehensive assessment of *group performance* in the course of simulated emergency situations. During the evaluation sessions, the interactions between the instructor and the crew are almost *one-sided*. Instructors focus attention on the individual operator's *mistakes only* and the erring operators are *blamed* by them. Evaluation sessions *do not enhance* the shared view, the common understanding and norm within the crew.	Collect and summarize the operators' attitudes and experiences gained from their daily work routine and forward them to the training experts who are responsible for designing and scheduling training programmes, producing teaching aids, and preparing scenarios of simulated emergency situations etc. Provide a special teacher training course (including special skill-development sessions and other psychological exercises) and produce comprehensive teaching materials on HF issues for the NPP's teaching staff. A special team-evaluation methodology and advanced techniques (called **COSMOS** – *Computer Supported Method for Operators' Self-assessment*) has been developed, implemented and introduced at the Simulator Centre in order to provide a much wider scope and more reliable feedback about the crew performance, to create a more balanced and friendly interactive environment for the performance assessment and to improve the effectiveness of the whole training-evaluating process.

Analysis 2.

A **questionnaire based survey** carried out in 1997 about the **working conditions and training needs of maintenance personnel** (N=145)

Table 2.

Main outcomes, problems to be solved	Interventions
There is a continuously changing composition of maintenance personnel due to the privatization process going on in the national energy sector. There is an *increasing* ratio of the people within the maintenance staff who are *not employed by the NPP*. (Recently, this ratio is about 30-40 %).	Contributing to the competency based design of a comprehensive training programme for maintenance personnel based upon the SAT (Systematic Approach to Training) philosophy which has been introduced and financially supported by the IAEA. ("*Hungarian Model Project*")
The maintenance personnel consist of many, relatively *low educated* people. (Among them only less than 20 % possess secondary school or technician certificates). Until now there was *no regular training* provided for the maintenance people.	Contributing to the development and implementation of appropriate teaching materials and teaching aids which can be used in the newly established MTC (Maintenance Training Centre) where maintenance personnel can acquire the necessary skills practicing on real plant components and mock-ups.
Maintenance work within Paks NPP can be characterized was a *stressful* activity performed in strong *time-pressure*, because the NPP's top management provides high priority to the reducing of the duration of outages.	Adaptation of COSMOS-method to the maintenance activity environment.
According to the maintenance staff, in general, 55 % of the total sum of the occurred errors during maintenance activities are *directly related* to the improper *human* behavior and/or *managerial* deficiencies or weaknesses.	Providing a set of course books for a special training course for the teaching staff of MTC in order to improve their pedagogical competence and teaching skills. The teaching package includes the following course books: "*Designing training programmes"* ***"Planning the teaching process"*** *"Quality insurance in education"* *"Methods of adult training"*
The maintenance teaching staff can be characterised with a high level of professional competencies but *without an appropriate didactical and psychological preparedness* for their teaching activity.	*"How to develop teaching materials and teaching aids?"* *"Guidelines for making presentations and using didactic equipment"* *"Methodological issues of individual assessment"* *"Groups' evaluation and development"* *"Reader: Selected articles of pedagogical and psychological literature"*

Analysis 3.

Both questionnaire(N=159) and interview (N 40) based survey carrying out in 1999 about the **safety culture level of the NPP**

Table 3.

Main outcomes	Interventions
There is an ongoing project, which will be completed at the end of this year. Results of the survey reflect the level of *safety culture* at the Paks NPP compared to a similar survey carried out in 1994.	Results of the representative survey on safety culture has already been reported to the management.
The following four functional fields are represented in the survey through randomly selected samples taking from: *Operational personnel* *Maintenance personnel* ***Radiation protection*** *Technical staff*	A detailed extract of the survey will be presented and discussed at different organizational levels of the NPP during the coming months.
On the base of the empirical data it can be emphasized that the level of safety culture at Paks NPP has been considerably improved since 1994. It has been proved also that the leadership, the social atmosphere, and the training have significant impacts on the safety culture of the power plant.	The main issues/findings of this survey will be transformed to teaching materials and will be incorporated in an appropriate way, into the training programmes for both the operating and maintenance personnel.

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Consultants Meetings

Waterford, Connecticut, United States of America 24–28 May 1999,
Vienna, Austria: 20–23 March 2000

Advisory Group Meeting

Vienna, Austria: 4–7 October 1999