SECY-00-0053

February 29, 2000

FOR: The Commissioners

FROM: William D. Travers /RA/ Executive Director for Operations

SUBJECT: NRC PROGRAM ON HUMAN PERFORMANCE IN NUCLEAR POWER PLANT SAFETY

PURPOSE:

The purpose of this paper is to inform the Commissioners of the status of the development of an integrated program on human performance in nuclear power plant safety for the agency. The goals of this program are to ensure that NRC human performance activities are directed at better understanding the risk significance of human performance, and to improve our ability to model human performance and to use risk insights to inform regulatory activities. The planning process for this program will include further risk studies, a scoping study, and the involvement of various stakeholders and peer review.

BACKGROUND:

In SECY-98-244, October 22, 1998, the staff submitted the September 1998 version of the human performance plan, including a brief history of NRC human performance activities. That document was described as a work in progress, since a more risk-informed process needed to be developed to incorporate insights from quantitative risk assessments. The process subsequently developed includes: (1) a detailed review and analysis of important human actions contained in Accident Sequence Precursor (ASP) program risk models and results, associated licensee event reports, and related inspection or investigation reports; (2) review of individual plant examination (IPE) reports focusing on important human performance actions; and (3) review of other reports where critical human performance actions are identified; this process was presented to the ACRS on February 4, 1999. In a letter to the Commission dated February 19, 1999, the ACRS stated that the staff had described a disciplined strategy for the development of a technically justifiable plan.

DISCUSSION:

The attachment to this paper is "The NRC Program on Human Performance in Nuclear Power Plant Safety. The primary goal of this program is to support the agency's strategic goal of maintaining reactor safety. The research initiatives of the program are also consistent with the RES vision (SECY-99-281) to conduct independent experiments and analyses, to develop technical bases for realistic safety decisions, and to prepare the agency for the future by evaluating safety issues involving current and new designs and technologies. This program is limited to human performance activities in NRR and RES that relate to nuclear power plant safety. The original intent was to include human performance activities in NMSS. However, NMSS has been involved in a study of how to best risk-inform NMSS programs and has not been able to participate in this version of the human performance program. NMSS plans to establish a risk assessment and management group that would participate in the agency-wide coordination of human performance activities in the future.

The program was developed based on a review of risk information, as well as information from other sources such as user needs, activities in the domestic and international nuclear industry, and human performance programs in other applications. Detailed results of these analyses are in the attachment. The risk information was derived from ASP analyses, review of the IPE lessons learned report, and from numerous reports of PRA sensitivity studies. These analyses indicate that human performance has a significant impact on the risk from nuclear power generation. Specifically, operating experience indicates that latent failures resulting from deficient human performance in maintenance, testing, or work processes can impact equipment failure probabilities. Studies of PRA results found human error to be a significant contributor to CDF, that by improving human performance licensees can substantially reduce their overall CDF, that a significant human contribution to risk is in failure to respond appropriately to accidents, and that human performance is important to the mitigation and recovery from failures. The review also determined that in-depth quantitative analysis methods are not currently available to determine the relative contribution of specific human performance issues, (e.g., knowledge, training, procedures, fatigue, communications) to CDF. To do such in-depth analyses, new methods and sources of data will be needed.

In addition to the risk information, the staff reviewed other information to determine their applicability to the planning process. These include human performance activities in the domestic and international nuclear industry, human performance programs at other agencies, and changes to the regulatory activities of the NRC. Details on these reviews are in the attachment.

In the domestic nuclear industry the two organizations that are most involved with human performance issues are the Electric Power Research Institute (EPRI) and the Institute for Nuclear Power Operations (INPO). The topics covered by the EPRI program include leading indicators, corrective action selection system, human performance management, automated human performance analysis tools, capturing undocumented worker job knowledge, work force and labor market assessment, and engineer/supervisor proficiency evaluation. The activities covered by INPO include: support to the National Academy of Nuclear Training for the accreditation of selected training programs, operating the "Excellence in Human Performance" program, and conducting plant evaluations and assist visits.

On the international front, both the International Atomic Energy Agency (IAEA) and the Nuclear Energy Agency (NEA) have ongoing efforts in the area of human performance. Some topics of interest include safety culture, work processes, human system-interface, computerized procedures, the effects of automation, decommissioning, and human reliability analysis. The OECD Halden Reactor Project is an active international cooperative project that addresses many of these topics.

Several Federal agencies have active human performance programs in research, development, regulation, or oversight. Review of these agencies' programs demonstrates that the NRC program is in the mainstream of human performance research and application and allows the NRC to take advantage of work done by others.

The human performance program contributed directly to the development of a supplemental inspection procedure related to the human performance crosscutting issue for the reactor oversight process (SECY-99-007). As part of the effort to risk-inform regulations (SECY-98-300), the human performance effort will consider those regulations related to human performance and will provide data, accident sequences, and human performance contributors to be considered in risk-important accident sequences.

THE NRC PROGRAM ON HUMAN PERFORMANCE IN NUCLEAR POWER PLANT SAFETY:

Mission

The mission of the NRC Program on Human Performance in Nuclear Power Plant Safety (PHP) is to ensure that reactor safety is maintained through effective regulation and oversight of human performance in the design, operation, maintenance, and decommissioning of nuclear reactor facilities. This will be accomplished by: (1) identifying human performance issues important to public health and safety, (2) increasing understanding of the causes and safety implications of these human performance issues, and then (3) implementing the appropriate regulatory response to human performance issues.

Program Elements

The program is described in detail in the attachment. Figure 1 in the attachment depicts the relationship among PHP activities and the relationship of the PHP with other NRC program areas. There are four key NRC program areas to which the PHP contributes: Reactor Oversight Process, Plant Licensing and Monitoring, the agency's Risk-Informed Regulation Implementation Plan, and Emerging Technology/Emerging Issues.

The Reactor Oversight Process area includes activities that support plant inspections and the evaluation of human performance as a cross-cutting issue. Thus far, this area has supported work involving the development of inspection tools for supplemental inspections. The Plant Licensing and Monitoring program area includes reviews of licensing actions and the monitoring of plant and program performance. Under the Regulatory Initiatives activity, the staff reviews Commission policies related to human performance in response to identified problems and provides support to rulemaking and Regulatory Guide development.

Support to the Risk-Informed Regulation Implementation Plan program area involves generation, collection, and evaluation of data on human performance that can be used in human reliability analysis (HRA) models. The information will be evaluated to provide data on insights to support risk-informed regulation and to provide an independent capability to evaluate industry PRA/HRA models.

The Emerging Technology/Emerging Issues program area is targeted at preparing the NRC for the future. The two activities in the program are control station design review guidance and deregulation. As nuclear power plant analog controls and displays age, they are being replaced with digital components. The agency needs to be prepared to review safety issues involving the human-system interfaces of new designs and technologies. As an RES initiative, a study to identify issues important to safety that could result from economic deregulation will be completed in the second quarter of FY 2000. If new safety issues are identified, the issues will be considered for inclusion in the PHP.

RESOURCES:

Resources for this program are assigned during the annual budgeting process by the individual Offices. Resources for the Human Performance program activities are included in the FY2000 budget within RES and NRR. The FY-2000 budget includes $1.2M and 3.0 FTE in RES, of which $600K and 0.4 FTE is user need based, and $120K and 3.6 FTE in NRR. The budget for FY-2001 is $900K and 1.8 FTE in RES, of which $650K and 0.4 FTE is user need based, and $120K and 2.8 FTE in NRR. Based on the formalization of NRR user needs and the outcomes of the analyses and workshop described in the future activities listed below, some reprogramming among specific activities may be needed in FY-2000 and 2001. The program activities will be further prioritized as part of the FY-2002 budget deliberations.

COORDINATION:

The Office of the Chief Financial Officer has reviewed this paper for resource implications and has no objections. The Office of the General Counsel has no legal objection to this paper.

FUTURE ACTIVITIES:

Staff recognizes that the plan as described in the attachment only includes activities through 2001. Before formulating longer-term activities, there is a need to complete the risk analyses and to synthesize and assimilate the information using peer and stakeholder input. Therefore, a stakeholder/peer review workshop will be scheduled in 2000 to review the program and supporting information. The participants will be from the nuclear industry, public interest groups, national laboratories, research institutions, as well as human performance, human factors, and human reliability practitioners. The purpose of the workshop will be to assess the risk information and other supporting materials and to aggregate the information to identify the need for and prioritization of future activities for the human performance program. The intent is to identify the scope of information needed and, when appropriate, use existing sources of information to achieve program goals.

This program has not yet been reviewed by the ACRS. Staff is in the process of scheduling ACRS full and subcommittee meetings in early 2000.

The analysis of ASP events will continue in FY-2000. It will be combined with a risk-informed scoping study to identify risk-important human performance issues as future activities for the program.

The staff will continue to monitor and participate in industry and international activities and will participate in consensus standards activities with the American Nuclear Society and the Institute for Electrical and Electronics Engineers.

An update to this program will be forwarded to the Commission in the second quarter of FY-2001.

/RA/

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Attachment: As stated

ATTACHMENT

HUMAN PERFORMANCE PROGRAM PLAN

This paper describes a comprehensive program for ensuring that human performance is properly addressed in a risk-informed regulatory framework for maintaining reactor safety. The program was developed based on a review of risk information, as well as information from sources, such as, user needs, activities in the domestic and international nuclear industry, and human performance programs in other applications. The research initiatives of the program are also consistent with the RES vision in that independent experiments and analyses are conducted, technical bases for realistic safety decisions are developed, and safety issues involving current and new designs and technologies are evaluated to prepare the agency for the future.

MISSION:

The mission of the NRC Human Performance Program is to ensure that reactor safety is maintained through effective regulation and oversight of human performance in the design, operation, maintenance, and decommissioning of nuclear reactor facilities. This will be accomplished by: (1) identifying human performance issues important to public health and safety, (2) increasing understanding of the causes and safety implications of these human performance issues, and then (3) implementing the appropriate regulatory response to human performance issues.

BASIS FOR PROGRAM ACTIVITIES:

User needs, ongoing programs and the analyses described below were used to identify issues and activities. Continuing analyses are planned. The research activities described below will contribute to the increased understanding of the causes and implications of human performance issues. The NRR human performance activities, along with the reactor oversight process (SECY-99-007), describe the regulatory response.

Review of Risk Information:

In an attempt to better risk-inform the program, the staff has several quantitative and qualitative studies of ASP and PRA data in progress, which have provided insight into the contribution of human performance to risk. ASP reports for events with conditional core damage probability (CCDP) >1.0E-5 in the time period 1992-1997 have been reviewed to better understand the role of human performance and its contribution to the significance of the events. Analyses are currently under way at INEEL to quantify the contribution of human performance to core damage frequency. To date, 13 of 48 events have been analyzed. In addition, risk insights were gleaned from a number of sources, including sensitivity studies on human error (e.g., NUREG/CR-5319 (1989) and NUREG/CR-5527 (1990) and licensees' Individual Plant Examinations (IPEs) as documented in NUREG-1560 (1997).

Although quantitative studies of human performance associated with significant events are still ongoing, preliminary findings indicate that human performance (including event cause, as well as positive and negative recovery actions) played a significant role in many of the ASP events. Of the 48 recent (1992-97) events having CCDPs > 1.0E-05, 38 (79%) involved human performance issues. In 35 out of the 48 (73%) events, deficient human performance causedone or more risk significant equipment failures. In total, the staff identified 63 instances of equipment failure induced by human performance in the 48 ASP events. The performance shaping factors (PSFs) that tended to drive the equipment failures included procedure quality, communications, and procedure use. Mechanical maintenance personnel contributed to most of the equipment failures, followed by electrical or I&C technicians, and engineering or design staff. One important insight that stemmed from the study is that control room personnel only contributed to a small fraction (6 of 63) of the equipment failures.

Evidence from these analyses suggests that latent errors, including those associated with maintenance errors, are an important contributor to the significance of the highest conditional core damage probability events which have occurred over the last five years. Latent errors, as used here, are characterized by James Reason (1990) as those that occur previous to the event and influence the event in some manner. However, they are seldom explicitly modeled in PRAs because most analysts assume they are implicitly accounted for in equipment failure rates. Errors can be introduced by a variety of human and organizational sources, some of which influence the significance of operating events. In general, the work processes by which human errors were introduced include design, review, configuration management of drawings and procedures, maintenance, surveillance, and corrective actions. In a later work by Reason (1997), which is based on the review of numerous major accidents from around the world, the term latent conditions is used to characterize problems resulting from poor design, gaps in supervision, undetected manufacturing defects, maintenance failures, unworkable procedures, clumsy automation, shortfalls in training, or less than adequate tools and equipment. Such conditions may be present for many years before they combine with local circumstances and active failures to penetrate a system's defenses.

Sensitivity studies also found that human performance can become a significant contributor to core damage frequency (CDF) if allowed to degrade. This is because human performance cuts across many plant areas, including plant design, operation, testing, and maintenance. Sensitivity studies documented in NUREG/CR-5319 and NUREG/CR-5527 indicated that small changes (factors of three to ten times) in human error probability (HEP) in response to accidents could result in notable swings in CDF. For example in NUREG/CR-5319, a decrease in HEP by a factor of two reduced the CDF by a factor of five, demonstrating the benefit that can be gained from improved human performance. Larger changes in HEPs (26 times up or down) resulted in CDF changing by four orders of magnitude (10-6 to 10-2). In NUREG/CR-5527, the results also show sensitivity of the risk parameters to changes in HEPs, in both the increase and the decrease directions. Changes in HEPs (29 times up or down) resulted in CDF changing by a factor of 3.5 in the decrease direction and a factor of 10 in the increase direction. Most of this change in CDF occurred with relatively small changes in HEPs (a factor 5 times). Other studies such as NUREG-1560, which summarized perspectives and insights from the 75 IPEs (covering 108 nuclear power plant units), also found human error to be a significant contributor to CDF, and that by improving human performance licensees can substantially reduce their overall CDF.

In summary, the information above indicates that human performance has a significant impact on the risk from nuclear power generation. Specifically, operating experience indicates that latent failures resulting from deficient human performance in maintenance, testing, or work processes can impact equipment failure probabilities. PRAs tend to indicate that a significant human contribution to risk is in failure to respond appropriately to accidents. The analyses also indicate that human performance is important to the mitigation and recovery from failures. In the past the human performance activities have focused on operators and operational problems. The information from ASP analyses on latent failures suggests that a more balanced human performance program would also address potential issues related to latent conditions and the determination of whether these conditions can manifest themselves as common cause failures that would subsequently impact plant risk. Further, in-depth quantitative analysis methods are not currently available that permit determining the relative contribution of specific human performance issues, e.g., knowledge, training, procedures, fatigue, communications, to CDF. To do such in-depth analyses, new methods and sources of data may need to be developed. One such method, which is in development, is ATHEANA (A Technique for Human Event Analysis). ATHEANA has the potential to better determine the contribution of the elements of human behavior to plant risk. ATHEANA is being developed to better assess human-induced initiating events and post-initiating human errors, however the techniques developed may also be useful in the analysis of latent conditions as well.

Reviews of Other Related Activities:

In addition to the risk information described above, the staff reviewed other related sources to determine their applicability to the planning process. These include human performance activities in the domestic and international nuclear industry, human performance programs at other agencies, and changes in the regulatory activities of the NRC, most notably the new reactor oversight program and the transition to risk-informed regulatory approaches.

Review of Industry And International Human Performance Programs:

In the domestic nuclear industry the two organizations that are most involved with human performance issues are the Electric Power Research Institute (EPRI) and the Institute for Nuclear Power Operations (INPO). There are two organizations within EPRI that sponsor human performance research: the Human Performance Technology Product Group of the Energy Conversion Division and the Strategic Science & Technology (SS&T) organization.

The topics covered include leading indicators, corrective action selection system, human performance management, automated human performance analysis tools, capturing undocumented worker job knowledge, work force and labor market assessment, and engineer/supervisor proficiency evaluation. The topics covered by INPO include activities such as: support to the National Academy of Nuclear Training accreditation of selected training programs, operating the "Excellence in Human Performance" program, and conducting plant evaluations and assist visits. Both the American Nuclear Society and the Institute for Electrical and Electronic Engineers have standards committees that address human performance topics and sponsor human performance topical conferences.

On the international front, both the International Atomic Energy Agency (IAEA) and the Nuclear Energy Agency (NEA), through the Committee on the Safety of Nuclear Installations (CSNI), have ongoing efforts in the area of human performance. Some topics of interest include safety culture, work processes, human system-interface, computerized procedures, the effects of automation, decommissioning, and human reliability analysis. The OECD Halden Reactor Project is an active cooperative project that addresses many of these topics.

A topic of particular interest in these organizations is safety culture, since it is often found to be the ultimate root cause of problems at nuclear power plants. At an IAEA International Conference on Topical Issues in Nuclear Radiation and Radioactive Waste Safety in September 1998, a working group paper on shortcomings in safety management symptoms, causes and recovery was developed. That paper cites case studies of nuclear power plant problems that resulted from safety culture problems. The nuclear facilities discussed included the Ontario Hydro shutdown of seven of their units in 1997, the 1996 Millstone problems, wide-spread problems identified at the Oskarshamm Unit 1 reactor in 1992, and the Management-Technology-Organization (MTO) review of Barseback Kraft AB by the Swedish regulator SKI. More recently (September 30, 1999), the nuclear criticality accident at the conversion test facility at JCO Tokai Works in which three workers were injured and a local evacuation was implemented because of the high radiation release was attributed to safety culture (S. Kondo, October 26, 1999).

The IAEA also sponsored the "International Topical Meeting on Safety Culture in Nuclear Installations" in 1995, which focused on positive steps to enhance safety culture. In June 1999 the NEA published a report, The Role of the Nuclear Regulator in Promoting and Evaluating Safety Culture, which focuses on early signs of declining safety performance and the role of the regulator in promoting and evaluating safety culture. Further, in recognition of the need to deal with important issues that cut across the disciplines of the various working groups, the CSNI is being restructured to include a Special Expert Group on Human and Organizational Factors. The special expert group will report directly to the CSNI, rather than to a working group.

Based on Commission direction (Staff Requirements: SECY-98-059), there is currently no research being done at the NRC in this area, though staff does keep abreast of the international activities associated with understanding the impact of safety culture on plant safety. If evidence is found to suggest that the agency should more specifically address safety culture, the staff will bring the issue to the Commission for action.

Human Performance Programs at Other Agencies:

Several Federal agencies have active human performance programs in research, development, regulation, or oversight. Two of these programs are department-wide, covering activities across all organizations within a cabinet-level department: the U.S. Department of Transportation, including the organizations responsible for aviation, marine, highway, and rail safety, and the U.S. Department of Defense, including each of the services. Other Federal agencies with active programs include the National Aeronautics and Space Administration, the Occupational Safety and Health Administration, the National Institute for Occupational Safety and Health, the Chemical Safety and Hazards Investigation Board, and the U.S. Department of Energy's Chemical Safety Program. Review of these agencies' programs demonstrates the similarity and breadth of the application of human performance technology throughout the government and the domains that government agencies impact. The similarities among the issues addressed confirm that the NRC program is in the mainstream of human performance research and application; they also allow the NRC to take advantage of work done by others. In fact, the NRC has adapted the findings of others when developing various review guidelines, e.g., NUREG-0700, Revision 1 (1996) by adapting guidance that was developed for other applications. Conversely, other agencies and industries have adapted some of the NRC work for their use, e.g., NUREG-0899 (1982) and other NUREG/CRs related to procedures.

Related NRC Programs:

The reactor oversight process (SECY-99-007) focuses on cornerstones of safety which are assessed through a combination of performance indicators and a risk-informed inspection program. The inspection program focuses on risk-significant activities and systems related to the cornerstones. There are three elements that are considered crosscutting to the cornerstones: human performance, safety-conscious work environment, and corrective action program. The human performance program contributed directly to the development of a supplemental inspection procedure related to the

human performance crosscutting issue. The program could also indirectly contribute to the other two issues, since safety conscious work environment is a human performance issue and many of the actions involved in corrective action programs result from human performance problems.

SECY-98-300 proposed options for modifying the regulations to make them risk-informed. The modifications could involve such actions as developing a new set of design basis accidents, adding provisions to Part 50 allowing for risk-informed alternatives to the present requirements, revising specific requirements to reflect risk-informed considerations, or deleting unnecessary or ineffective regulations. In the RES development of Option 3, regulations related to human performance, such as, the staffing and training rules, will be considered. In addition, the results of the human performance plan will provide data, sequences, and human performance contributors to be considered in risk-important accident sequences.

PROGRAM ELEMENTS:

The program is summarized in Figure 1 and a schedule is in Table 1. Table 1 also identifies whether the research is an RES initiative or if it is based on an anticipated or documented program office user need. There are four key program areas to which the Human Performance Program contributes: Reactor Oversight Process, Plant Licensing and Monitoring, the Risk-Informed Regulation Implementation Plan, and Emerging Technology/Emerging Issues.

The Reactor Oversight Process area includes activities that can support plant inspections and the evaluation of human performance as a cross-cutting issue. Thus far this area has supported work involving the development of inspection tools for supplemental inspections. Further, an RES initiative is to develop the Human Performance Evaluation Protocol (HPEP) as a potential tool for use by inspectors for more detailed investigations of a licensee's corrective action program when human performance is involved. The HPEP is a revision to the Human Performance Investigation Process (NUREG/CR-5455, 1993). The HPEP is being designed so that it could be used as part of the supplemental inspection program. It is expected that HPEP will be complete by the end of 2000. Future work (anticipated NRR user need) will be to characterize the extent to which human performance is captured in the revised reactor oversight process.

The regulatory responsibilities of the Plant Licensing and Monitoring program area are within NRR. This includes reviews of licensing actions, such as license transfers and changes to plant Technical Specifications. An RES initiative is to develop the technical basis for guidance to use in the review of plant changes which credit operator action in place of automatic actions. As part of the monitoring role, NRR staff maintains the Human Factors Information System (HFIS), which is used to store information about human performance issues identified by the NRC in inspection reports and licensed operator examination reports and by reactor licensees in Licensee Event Reports (LERs). These data are available for use by the NRC in its programmatic oversight of training, procedures, organizational processes, human-system interface, and communication. Staff has used the HFIS to identify potential issues that would be addressed or resolved through research. When requested, staff also participates in event evaluations from the human performance perspective. Under 10 CFR 50.120, "Training and Qualification of Nuclear Power Plant Personnel," the NRR staff monitors the industry training accreditation program and maintains the for-cause inspection procedure. These are all continuing activities.

Under the regulatory initiatives activity, the staff reviews Commission policies related to human performance in response to identified problems. For example, NRR staff is reassessing the Commission's policy on factors causing fatigue of operating personnel at nuclear power plants (Generic Letter 82-12, "Nuclear Power Plant Staff Working Hours"), based on Congressional inquiries and a Petition for Rulemaking (PRM-26-2). NRR human performance staff is also providing support to the staffing aspect of the decommissioning rulemaking and on the issue of workarounds. A revision to parts of Chapter 13, "Conduct of Operations," of the Standard Review Plan is completed and a revision to Chapter 18, "Human Factors Engineering," is planned for the future. These activities are accomplished as a need arises. RES is preparing to publish Revision 3 to Regulatory Guide 1.8.

Support to the Risk-Informed Regulation Implementation Plan program area involves generation, collection, and evaluation of data on human performance that can be used in human reliability analysis (HRA) models used in probabilistic risk analyses. HRA model development work is included in the Risk-Informed Regulation Implementation Plan and provides, among other things, the structure for defining the needed data, including information on the plant context of human actions. This human performance program then provides the needed data. Such data will be collected and evaluated from operational experience or produced from nuclear power plant simulators or other simulations in facilities such as the Halden Man-Machine Laboratory. The information will be evaluated to provide data on insights to support risk-informed regulation, including risk-informing 10 CFR Part 50 and to provide an independent capability to evaluate industry PRA/HRA models. This human performance program can provide the needed data. Issues identified from the data, such as the issue of latent conditions can be addressed here. This could include an evaluation of the impact of human performance on equipment unreliability and how latent errors relate to common cause failure.

The Emerging Technology/Emerging Issues program area is targeted at preparing the Agency for the future. The two activities in the program are control station design review guidance and deregulation. As nuclear power plant analog controls and displays age, they are being replaced with digital components. These new digital components can be very powerful and provide the operator with much more and better configured information. However, poorly designed human-system interfaces could mislead, confuse, or overwhelm the operator. An NRR user need requests that existing Guidance (NUREG-0700, Rev. 1, 1996) be revised for the efficient review of these new advanced systems. The guidelines are being developed for the review of modifications to control stations (e.g., hybrid control rooms). The revision to NUREG-0700 that is planned for 2001 will incorporate the results of ongoing studies of advanced alarm systems, display navigation, automation, computerized procedures, and issues specific to hybrid control stations, as well as ongoing research on automation, large screen displays, and human error at the Halden Reactor Project (Discussed in SECY-99-290). This area will integrate with the Digital Instrumentation and Control research plan that is being developed.

As an RES initiative in the Deregulation activity, a study to identify issues important to safety that could result from economic deregulation will be completed in the second quarter of FY 2000. If new safety issues are identified for research, the issues will be considered for inclusion in the Human Performance Program.

FUTURE ACTIVITIES:

This plan only includes activities through 2001. A stakeholder/peer review workshop will be scheduled in 2000 to review the RES aspects of the program and supporting information. The participants will be from the program offices, nuclear industry, public interest groups, national laboratories, research institutions, as well as human performance, human factors, and human reliability practitioners. The purpose of the workshop will be to assess the risk information and other supporting materials and to aggregate the information to identify the need for and prioritization of future activities for the human performance program. The intent is to identify the scope of information needed and, when appropriate, use existing sources of information to achieve program goals. For instance, issues such as latent error/conditions, work processes, and maintenance issues will be addressed at the workshop.

This program has not yet been reviewed by the ACRS. Staff is in the process of scheduling ACRS full and subcommittee meetings in early 2000. Those reviews will include more detail on the supporting information. The supporting information, e.g., results of risk analyses, will be in the form of staff and contractor reports that will be publicly available and are currently in preparation.

Not all of the ASP events have been reanalyzed using Standardized Plant Analysis Risk (SPAR) models to determine the contribution of human performance to event risk. This work will continue in FY-2000. It will be combined with a risk-informed scoping study to identify risk- important

human performance issues as future activities for the program.

The staff will also continue to monitor and participate in international activities through IAEA and CSNI and will participate in consensus standards activities with the American Nuclear Society and the Institute for Electrical and Electronics Engineers.

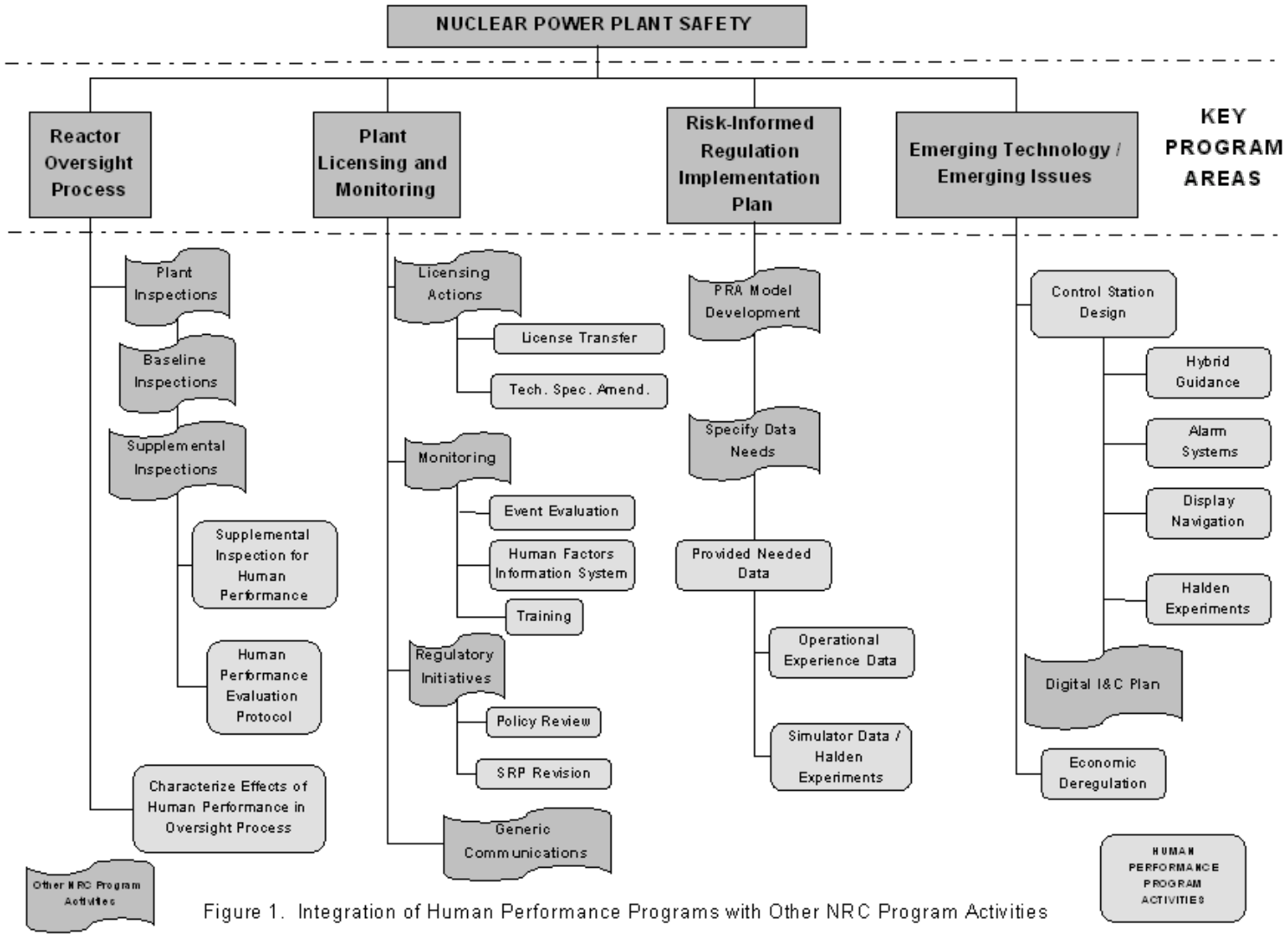

Figure 1. Integration of Human Performance Programs with Other NRC Program Activities

Table 1 Human Performance Program Schedule

ACTIVITY	MILESTONE	DATE	LEAD / SUPPORT OFFICE
Reactor Oversight Process			
Supplemental Inspection on Human Performance	Draft to Region for Comment	03/00	NRR/RES*
Human Performance Evaluation Protocol	Completion	12/00	RES*
Characterize the Effects of Human Performance in Reactor Oversight Process	Develop Plan	03/00	RES**
Plant Licensing and Monitoring			
Licensing Actions Credit for Operator Action	As needed Guidance Completed	 06/00	NRR RES*
HFIS	Continuing		NRR
Human Performance and Training Program Oversight	As needed		NRR
Regulatory Initiatives Fatigue Policy SRP Chpt. 13 SRP Chpt. 18 Reg. Guide 1.8 Reactor Decommissioning Rulemaking (Staffing)	 TBD Completed Completion Completion Rulemaking Plan	 TBD 12/99 FY02 3/00 06/00	 NRR NRR NRR RES*** NRR
Generic Communications	As needed		NRR
Risk-Informed Regulation Implementation Plan			

Operational Experience Reviews ASP Analysis	Continuing Final Report	 06/00	RES* RES*
Results for Simulator Experiments	As Available		RES*
Emerging Technology / Issues			
Control Station Review Guidance	Revision 2	09/01	RES***
Hybrid Control Stations	Interim Guidance	01/00	RES***
Alarm Systems	Interim Guidance	03/00	RES***
Interface Management	Interim Guidance	03/00	RES***
Halden Experiments	Ongoing		RES*
Integrate with Digital I&C Program	Ongoing		RES*
Economic Deregulation	Safety Issues Report	03/00	RES*
Continuing / Planning Activities			
Prioritize Activities in FY2001 Budget		06/00	RES/NRR
ACRS Review	Publish supporting documentation Subcommittee Full Committee	02/00 02/00 03/00	RES* RES/NRR RES/NRR
Identify Future Issues****	SPAR Analyses Develop Scoping Study Stakeholder/Peer Review	04/00 06/00 09/00	RES* RES* RES*
Update Human Performance Program Description	Commission Paper	04/01	RES*
International Cooperation and Consensus Standards Support	Ongoing		NRR/RES

* RES Initiative research

** Anticipated NRR User Need

*** Documented NRR User Need

**** Staff recognizes that the plan as described in the attachment only includes activities through 2001. Before formulating activities for 2001 and beyond, there is a need to complete the risk analyses and to synthesize and assimilate the information using peer and stakeholder input.

REFERENCES

***U.S. Nuclear Regulatory Commission**:*

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NUREG-1560, "Individual Plant Examination Program: Perspectives on Reactor Safety and Plant Performance," December 1997.

NUREG/CR-5319, "Risk Sensitivity to Human Error," January 1989.

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NUREG/CR-5527, "Risk Sensitivity to Human Error in the LaSalle PRA," February 1990.

NUREG/CR-6350, "A Technique for Human Error Analysis (ATHEANA), " May 1996.

***SECY Papers**:*

SECY-98-300, "Options for Risk-Informed Revisions to 10 CFR Part 50 - Domestic Licensing of Production and Utilization Facilities," 1998.

SECY-98-059, "Proposed Requirements for Assessing the Performance and Competency of Licensee Management," 1998.

SECY-99-007, "Recommendations for Reactor Oversight Process Improvements," 1999.

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