June 6, 2003

Mr. Charles Brooks
Staff Assistant
Industry and Government Relations
Institute of Nuclear Power Operations
700 Galleria Parkway, NW
Atlanta, GA 30339-5957

SUBJECT: REQUEST FOR REVIEW OF DRAFT NUREG REPORT ON UPDATED SPAR HRA METHODOLOGY

Dear Mr. Brooks:

In accordance with our peer review process, we are offering you the opportunity to review and comment on the enclosed draft NUREG report (Attachment; ADAMS Accession Number - ML031540084) on the updated human reliability analysis (HRA) methodology used in the Standardized Plant Analysis Risk (SPAR) models. This methodology was originally developed by the Idaho Engineering and Environmental Laboratory (INEEL) in 1994 for use in the plant-specific risk models used in regulatory activities, such as the Accident Sequence Precursor (ASP) Program. Based on experience gained from field-testing, this method was updated in 1999. Since that time, the NRC staff have been using this method to perform their risk-informed regulatory activities, such as determining the risk significance of inspection findings in Phase 3 of the Significance Determination Process (SDP), developing an integrated risk-informed performance measure in support of the reactor oversight process (ROP), and screening and analyzing operating experience data in a systematic manner to identify events/conditions that are precursors to severe accident sequences in the Accident Sequence Precursor (ASP) Program. Feedback from staff users and other experience at the INEEL in applying the method in HRAs led to an effort to enhance the general utility of the SPAR Human Reliability Analysis (SPAR- H) method. In addition, the method was reviewed and updated to enhance its applicability to low power and shutdown applications. During this revision, an uncertainty analysis capability was also added. Finally, the SPAR-H method regarding human error probability (HEP) dependency assignment was enhanced.

This draft NUREG presents a simplified HRA method for estimating the human error probabilities associated with operator and crew actions and decisions in response to initiating events at nuclear power plants. The methodology is not meant to be a substitute for more detailed HRA approaches, such as those used in ATHEANA. However, similar to the more detailed approaches, SPAR-H incorporates the performance shaping factors (PSFs) deemed most capable of influencing human performance. These are accounted for in the SPAR-H

quantification process. These factors include:

- Available time
- Degree of stress involved
- Experience and training of the operating crew
- Complexity of the task or recovery action
- Ergonomics (human-machine interface)
- Availability and nature of procedures
- Operator fitness for duty
- Work processes

Based upon review of first- and second-generation HRA methods, the SPAR-H method assigns human activity to one of two general task categories - action or diagnosis. Examples of action tasks include operating equipment, performing equipment line-ups, starting pumps, conducting calibration or testing, and other activities performed during the course of following plant procedures or work orders. Diagnosis tasks consist of reliance upon knowledge and experience of the operating crew to understand existing conditions, planning and prioritizing activities, and determining appropriate courses of action. Base error probabilities for the two task types associated with the SPAR-H method were compared with those from other HRA methods (e.g., THERP and ASEP). This comparison revealed that the human error probabilities estimated by the SPAR-H method fall within the range of error probabilities predicted by other HRA methods. The various performance shaping factors considered in the original SPAR HRA method were compared with the PSFs from other HRA methods and sources. The results of this comparison were used to make changes to the PSFs in the updated SPAR-H method.

The SPAR-H method addresses dependency among operator actions, that is, the influence of one human error upon subsequent human errors is considered by the model. The application of the SPAR-H method is relatively straightforward and follows the guidance for conducting HRA, which is available in a number of publicly available sources. Such sources include the IEEE Standard P1082 for HRA (1997), ASME Standard for PRA (ASME STD-RA-2002), and the EPRI Systematic Human Action Reliability Procedure (SHARP) documented in EPRI NP-3583.

A major feature of the SPAR-H method presented in this report is the SPAR-H Worksheet contained in Appendix A of the draft NUREG. The method for filling out these worksheets is described in the report. The worksheet concept makes the SPAR-H method relatively easy to use and renders it an ideal tool for screening analyses and analyses of operational events for which detailed human performance information may not be readily available in a timely manner.

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In a related matter, the NRC's Office of Nuclear Regulatory Research is conducting a public meeting on June 17, 2003, to discuss the SPAR-HRA Method. Information about this meeting was previously provided via separate communication.

Sincerely,

/RA/

Scott F. Newberry, Director
Division of Risk Analysis and Applications
Office of Nuclear Regulatory Research

Attachment: As stated

cc: w/o att:
J. Strosnider/A. Thadani, RES

June 6, 2003

Mr. Marvin Fertel
Nuclear Energy Institute
1776 I Street, N.W.
Suite 400
Washington, DC 20006-3708

SUBJECT: REQUEST FOR REVIEW OF DRAFT NUREG REPORT ON UPDATED SPAR HRA METHODOLOGY

Dear Mr. Fertel:

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Scott F. Newberry, Director
Division of Risk Analysis and Applications
Office of Nuclear Regulatory Research

Attachment: As stated

cc: w/o att:
J. Strosnider/A. Thadani, RES

June 6, 2003

Mr. David Lochbaum
Union of Concerned Scientists
1707 H Street, N.W.
Suite 600
Washington, DC 20006-3919

SUBJECT: REQUEST FOR REVIEW OF DRAFT NUREG REPORT ON UPDATED SPAR HRA METHODOLOGY

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Sincerely,

/RA/

Scott F. Newberry, Director
Division of Risk Analysis and Applications
Office of Nuclear Regulatory Research

Attachment: As stated

cc: w/o att:
J. Strosnider/A. Thadani, RES

June 6, 2003

Mr. John Gaertner, Senior Technical Leader
Risk Management
Electric Power Research Institute
P.O. Box 217097
Charlotte, NC 28221

SUBJECT: REQUEST FOR REVIEW OF DRAFT NUREG REPORT ON UPDATED SPAR HRA METHODOLOGY

Dear Mr. Gaertner:

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Sincerely,

/RA/

Scott F. Newberry, Director
Division of Risk Analysis and Applications
Office of Nuclear Regulatory Research

Attachment: As stated

cc: w/o att:
J. Strosnider/A. Thadani, RES

June 6, 2003

Mr. Frank J. Rahn, Manager
Risk-Based Prioritization
Electric Power Research Institute
3412 Hillview Avenue
Palo Alto, CA 94304-1395

SUBJECT: REQUEST FOR REVIEW OF DRAFT NUREG REPORT ON UPDATED SPAR HRA METHODOLOGY

Dear Mr. Rahn:

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Office of Nuclear Regulatory Research

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cc: w/o att:
J. Strosnider/A. Thadani, RES

June 6, 2003

Mr. Gordon Bischoff, Project Manager
Westinghouse Combined Owners Group
Mail Stop 5-16
P.O. Box 355
Pittsburgh, PA 15230-0355

SUBJECT: REQUEST FOR REVIEW OF DRAFT NUREG REPORT ON UPDATED SPAR HRA METHODOLOGY

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- Operator fitness for duty
- Work processes

Based upon review of first- and second-generation HRA methods, the SPAR-H method assigns human activity to one of two general task categories - action or diagnosis. Examples of action tasks include operating equipment, performing equipment line-ups, starting pumps, conducting calibration or testing, and other activities performed during the course of following plant procedures or work orders. Diagnosis tasks consist of reliance upon knowledge and experience of the operating crew to understand existing conditions, planning and prioritizing activities, and determining appropriate courses of action. Base error probabilities for the two task types associated with the SPAR-H method were compared with those from other HRA methods (e.g., THERP and ASEP). This comparison revealed that the human error probabilities estimated by the SPAR-H method fall within the range of error probabilities predicted by other HRA methods. The various performance shaping factors considered in the original SPAR HRA method were compared with the PSFs from other HRA methods and sources. The results of this comparison were used to make changes to the PSFs in the updated SPAR-H method.

The SPAR-H method addresses dependency among operator actions, that is, the influence of one human error upon subsequent human errors is considered by the model. The application of the SPAR-H method is relatively straightforward and follows the guidance for conducting HRA, which is available in a number of publicly available sources. Such sources include the IEEE Standard P1082 for HRA (1997), ASME Standard for PRA (ASME STD-RA-2002), and the EPRI Systematic Human Action Reliability Procedure (SHARP) documented in EPRI NP-3583.

A major feature of the SPAR-H method presented in this report is the SPAR-H Worksheet contained in Appendix A of the draft NUREG. The method for filling out these worksheets is described in the report. The worksheet concept makes the SPAR-H method relatively easy to use and renders it an ideal tool for screening analyses and analyses of operational events for which detailed human performance information may not be readily available in a timely manner.

Although the SPAR-H method is deemed suitable for many applications in a risk-informed regulatory environment, there are instances in which its use is not recommended. Obviously, if a sufficient amount of human performance data are available, use of such data to estimate human error probabilities is preferable to using the SPAR-H method. In the analysis of severe accidents, particularly in assessing post core damage operator recovery actions to mitigate radioactivity releases, the suitability of the SPAR-H PSFs and their associated ranges is yet to be determined. In addition, the SPAR-H method has not been evaluated for use in highly automated environments. This method is also not suitable for use in a life cycle design

process. Finally, if cognitive (diagnostic) activities are modeled and quantified with the SPAR-H method and are determined to pose a significant contribution to risk, then the analyst should employ a more complete HRA method, such as ATHEANA, to better define and quantify these events.

In light of this discussion we intend to use the SPAR-H methodology to assess the realistic range of uncertainty in HEP estimates including those that are more epistemic in nature. Application of this methodology is intended to include peer review to assure that methodological limitations and simplifications are appropriately addressed in the uncertainty associated with SPAR estimates. Examples of this usage include the Accident Sequence Precursor (ASP) Program, Significance Determination Process evaluations, and other less complex probabilistic risk assessment applications, subject to the limitations mentioned above.

We would appreciate receiving your comments on the report within 60 days from the date of your receipt of this letter. If you have any questions regarding this report, please contact Dr. Patrick O'Reilly (301-415-7570, pdo@nrc.gov) of my staff.

In a related matter, the NRC's Office of Nuclear Regulatory Research is conducting a public meeting on June 17, 2003, to discuss the SPAR-HRA Method. Information about this meeting was previously provided via separate communication.

Sincerely,

/RA/

Scott F. Newberry, Director
Division of Risk Analysis and Applications
Office of Nuclear Regulatory Research

Attachment: As stated

cc: w/o att:
J. Strosnider/A. Thadani, RES

June 6, 2003

Mr. James Mallay
B&W Owners Group Services
Framatome Technologies, Inc.
P.O. Box 10935
Lynchburg, VA 24506-0935

SUBJECT: REQUEST FOR REVIEW OF DRAFT NUREG REPORT ON UPDATED SPAR HRA METHODOLOGY

Dear Mr. Mallay:

In accordance with our peer review process, we are offering you the opportunity to review and comment on the enclosed draft NUREG report (Attachment; ADAMS Accession Number - ML031540084) on the updated human reliability analysis (HRA) methodology used in the Standardized Plant Analysis Risk (SPAR) models. This methodology was originally developed by the Idaho Engineering and Environmental Laboratory (INEEL) in 1994 for use in the plant-specific risk models used in regulatory activities, such as the Accident Sequence Precursor (ASP) Program. Based on experience gained from field-testing, this method was updated in 1999. Since that time, the NRC staff have been using this method to perform their risk-informed regulatory activities, such as determining the risk significance of inspection findings in Phase 3 of the Significance Determination Process (SDP), developing an integrated risk-informed performance measure in support of the reactor oversight process (ROP), and screening and analyzing operating experience data in a systematic manner to identify events/conditions that are precursors to severe accident sequences in the Accident Sequence Precursor (ASP) Program. Feedback from staff users and other experience at the INEEL in applying the method in HRAs led to an effort to enhance the general utility of the SPAR Human Reliability Analysis (SPAR- H) method. In addition, the method was reviewed and updated to enhance its applicability to low power and shutdown applications. During this revision, an uncertainty analysis capability was also added. Finally, the SPAR-H method regarding human error probability (HEP) dependency assignment was enhanced.

This draft NUREG presents a simplified HRA method for estimating the human error probabilities associated with operator and crew actions and decisions in response to initiating events at nuclear power plants. The methodology is not meant to be a substitute for more detailed HRA approaches, such as those used in ATHEANA. However, similar to the more detailed approaches, SPAR-H incorporates the performance shaping factors (PSFs) deemed most capable of influencing human performance. These are accounted for in the SPAR-H

quantification process. These factors include:

- Available time
- Degree of stress involved
- Experience and training of the operating crew
- Complexity of the task or recovery action
- Ergonomics (human-machine interface)
- Availability and nature of procedures
- Operator fitness for duty
- Work processes

Based upon review of first- and second-generation HRA methods, the SPAR-H method assigns human activity to one of two general task categories - action or diagnosis. Examples of action tasks include operating equipment, performing equipment line-ups, starting pumps, conducting calibration or testing, and other activities performed during the course of following plant procedures or work orders. Diagnosis tasks consist of reliance upon knowledge and experience of the operating crew to understand existing conditions, planning and prioritizing activities, and determining appropriate courses of action. Base error probabilities for the two task types associated with the SPAR-H method were compared with those from other HRA methods (e.g., THERP and ASEP). This comparison revealed that the human error probabilities estimated by the SPAR-H method fall within the range of error probabilities predicted by other HRA methods. The various performance shaping factors considered in the original SPAR HRA method were compared with the PSFs from other HRA methods and sources. The results of this comparison were used to make changes to the PSFs in the updated SPAR-H method.

The SPAR-H method addresses dependency among operator actions, that is, the influence of one human error upon subsequent human errors is considered by the model. The application of the SPAR-H method is relatively straightforward and follows the guidance for conducting HRA, which is available in a number of publicly available sources. Such sources include the IEEE Standard P1082 for HRA (1997), ASME Standard for PRA (ASME STD-RA-2002), and the EPRI Systematic Human Action Reliability Procedure (SHARP) documented in EPRI NP-3583.

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Although the SPAR-H method is deemed suitable for many applications in a risk-informed regulatory environment, there are instances in which its use is not recommended. Obviously, if a sufficient amount of human performance data are available, use of such data to estimate human error probabilities is preferable to using the SPAR-H method. In the analysis of severe accidents, particularly in assessing post core damage operator recovery actions to mitigate radioactivity releases, the suitability of the SPAR-H PSFs and their associated ranges is yet to be determined. In addition, the SPAR-H method has not been evaluated for use in highly automated environments. This method is also not suitable for use in a life cycle design

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Sincerely,

/RA/

Scott F. Newberry, Director
Division of Risk Analysis and Applications
Office of Nuclear Regulatory Research

Attachment: As stated

cc: w/o att:
J. Strosnider/A. Thadani, RES

June 6, 2003

Mr. Jack Gray, Chairman
BWR Owners Group
Entergy Nuclear
440 Hamilton Avenue
P.O. Box 5029
White Plains, NY 10601

SUBJECT: REQUEST FOR REVIEW OF DRAFT NUREG REPORT ON UPDATED SPAR HRA METHODOLOGY

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/RA/

Scott F. Newberry, Director
Division of Risk Analysis and Applications
Office of Nuclear Regulatory Research

Attachment: As stated

cc: w/o att:
J. Strosnider/A. Thadani, RES

IDENTICAL LETTERS DATED: 6/6/03

SUBJECT: REQUEST FOR REVIEW OF DRAFT NUREG REPORT ON UPDATED SPAR HRA METHODOLOGY

DOCUMENT NAME: A:\HRARPRTEXTNL1.WPD

Distribution w/o att:
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Identical Letters:

Mr. Charles Brooks
Staff Assistant
Industry and Government Relations
Institute of Nuclear Power Operations
700 Galleria Parkway, NW
Atlanta, Georgia 30339-5957

Mr. Marvin Fertel
Nuclear Energy Institute
1776 I Street, N.W.
Suite 400
Washington, D. C. 20006-3708

Mr. David Lochbaum
Union of Concerned Scientists
1707 H. Street, N.W.
Suite 600
Washington, D. C. 20006-3919

Mr. John Gaertner, Senior Technical Leader
Risk Management
Electric Power Research Institiute
P.O. Box 217097
Charlotte, NC 28221

Mr. Gordon Bischoff, Project Manager
Westinghouse Combined Owners Group
Mail Stop 5-16
P. O. Box 355
Pittsburgh, PA 15230-0355

Mr. James Mallay
B&W Owners Group Services
Framatome Technologies, Inc.
P.O. Box 10935
Lynchburg, VA 24506-0935

Mr. Jack Gray, Chairman
BWR Owners Group
Entergy Nuclear
440 Hamilton Avenue
P.O. Box 5029
White Plains, NY 10601

Mr. Frank J. Rahn, Manager
Risk-Based Priorization
3412 Hillview Avenue
Palo Alto, CA 93404-1395

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DATE	6/2/03		6/2/03		6/4/03		6/6/03	

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REMARKS

REQUEST FOR REVIEW OF DRAFT NUREG REPORT ON UPDATED SPAR HRA METHODOLOGY - External stakeholders.

FROM: (Name, org. symbol, Agency/Post)

Room # - Bldg.

Phone #