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THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

INFORMATION

To: D. H. Roy- Manager, Engineering Department

From

J. H. Taylor- Manager, Licensing (2317)

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Cust.

File No. LS-5
or Ref.

Subj.

Probabilistic Risk Assessment Capability

Date
December 14, 1979

This letter is to advise you of the information and the request only.

- References: (1) Letter from C. D. Morgan to D. H. Roy, dated Nov. 20, 1979
Subject: Reliability - Risk Assessment Capability
- (2) Letter from A. S. Heller to D. H. Roy, dated December 6, 1979
Subject: NRC Letter of November 16, 1979

For what its worth I would like to endorse the general concern expressed in the two above referenced letters. I would like from a licensing point of view, to add support for the information in these letters.

With the current energy situation being as it is, the indications are that political pressure is beginning to develop in support of nuclear power. I believe this momentum will continue to build and as it does more emphasis will be placed on relative risks of various energy sources. There will undoubtedly be many arguments about these comparisons but one fact is inescapable: quantitative assessment of risk will receive a lot of attention.

Also as a part of the post TMI attitude about risk, support is building both within the industry and outside of it to establish a quantitative safety goal for nuclear power plants. With the IREP activities being initiated with the Crystal River study all utilities are going to be required to have some familiarity with probabilistic risk assessment methodology and reliability engineering methodology. This means that the demand for work in these areas will likely rise sharply and the competition for qualified people will be intense.

In conclusion I support Dr. Morgan's plea for more emphasis in this area and I believe that the number of people dedicated to this type of work in Tech Staff should probably go up by a factor of 2 or 3 above what it is at the present time.

On a related note I received a telephone call on December 7, 1979, from Frank Rowes who was alerting me of an IEEE Conf./Workshop to be held on January 15, 16, & 17 at the Shoreham-Americana Hotel in Washington on the subject of reliability and reliability assurance. They would like to have one or two people from B&W and each of the other vendors in attendance at this conference/workshop. They intend to have a total of 30-40 people in attendance and the overall purpose as I understood it is to have people from

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Charles Shapiro CSR
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the nuclear industry and the Nuclear Regulatory people talk to personnel from the Aerospace and Weapons Industry to assess opportunities for technology transfer from the latter to the former in the reliability engineering area. Rowesome mentioned that he is trying to push the concept of folding reliability engineering into existing QA efforts so that the QA does indeed become reliability assurance. I suggested that he send this information to you and I believe it would be very appropriate for you to be one of the representatives at this workshop conference to gain some further insight in to where this movement is headed. This IEEE conference is just another indication of the developing interest in this area.

JHT/fw

cc: E. R. Kane W/attachments
E. V. DeCarli "
K. E. Suhrke "
G. O. Geissler/J. D. Agar (w/attach)
E. A. Womack (w/o attach)
C. D. Morgan (w/o attach)

J H Taylor fw

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THE BASCOCK & WILCOX COMPANY
POWER GENERATION GROUP

J. H. T.

cc: F. Horman
G. D. Quale
E. A. Womack
L. J. Stanek
K. E. Suhrke

DEC 3 1979

To: D. H. ROY, MANAGER, ENGINEERING DEPARTMENT

From

G. D. MORGAN, MANAGER, TECHNICAL STAFF

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File No.
or Ref.

Subj.

RELIABILITY - RISK ASSESSMENT CAPABILITY

Date

NOVEMBER 20, 1979

This letter is to be used only when necessary and not to be used as a substitute for a report.

Attachment: G. F. Malin to G. D. Morgan, "Trip Report -
NRC's CR Study and Safety Conference",
November 15, 1979.

I have discussed with you previously my concern over the role of reliability techniques and the desirability of implementing these techniques to improve availability. The attachment and my attendance at the Water Reactor Safety Meeting has increased my level of concern. At the Water Reactor meeting, Saul Levine outlined the NRC's plans in the risk assessment area. The NRC plans to perform a mini-WASH-1400 on every reactor—with Crystal River Unit 3 as the lead plant. In the process of performing these studies, they will be training NRC engineers in reliability-risk assessment techniques. Mr. Levine estimates that the capability of the NRC staff will be extended from three engineers with a good knowledge of reliability-risk assessment techniques to approximately 30.

In the early 1970's Technical Staff started developing competence in the reliability techniques. We have the computer programs required to perform a WASH-1400 type analysis and five engineers who have experience in statistical applications to engineering problems and reliability techniques. However, in the past two years R&D funding in this area has been cut way back and the engineers have been supported by contract work. (The R&D funding has been for statistical core design which uses statistical methods but has little direct spin-off to WASH-1400 type analysis, probabilistic fracture mechanics and insufficient support for RADGAS.) Thus while we have maintained a competent staff, we have not made much improvement in our methods capability in the WASH-1400 area or have we aggressively used reliability techniques to improve system availability.

The TMI-2 incident has created an overload in Technical Staff in the reliability area. In view of the NRC's intention to perform mini-WASH-1400's on all plants and, by implication, put more emphasis on the results of risk assessment studies I foresee a large increase in the demands for this type of work. I am also concerned that if B&W does not have adequate methods and personnel in this area, the NRC will be dictating design requirements based on risk assessment studies that may not be justified.

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I have the following recommendations:

1. Technical Staff (Grog Malan) should be more involved in the front end of programs where reliability techniques are being employed. Too often we are asked to perform a specific piece of a study (main feedwater and auxiliary feedwater reliability studies for the Technical Product Evaluation Project, for example) without being given the opportunity to show how risk assessment techniques can be used in the overall project. The upcoming Crystal River 3 study should have Mr. Malan's close involvement.
2. NPCO must train more engineers in reliability techniques. Technical Staff has presented several training programs in the reliability area; however, we judge them to be only marginally satisfactory since the majority of the engineers did not do the homework. I believe that engineers must be identified in Plant Design and the Equipment Engineering areas who would be interested in developing skills in the reliability area and who view this as part of their career plan. (The long range plan originally was for Technical Staff to provide methods and consulting in the reliability area and as the contract work load increased to a reasonable magnitude, the contract work would ultimately be located in the contract sections. I believe that this could occur in the next two to three years.) These engineers should be assigned to contract risk assessment projects under the guidance of a Technical Staff engineer, since I believe that the best way to learn a methodology is to use it. There are very few trained reliability engineers; thus I believe that we must train our own and not count on being able to hire them when the overload is too great.
3. The R&D program must recognize that reliability methodology must be kept current. At the present time everyone gives lip service to the need for reliability methods but no one wants to pay for it. The RADCAS system is a good example. The manager of the safety area of the R&D program, where most of the System Reliability & Controls Unit's work is funded, says that the RADCAS system is not really required for safety. In his judgement it belongs in the availability area. The manager of the availability area says that the Customer Service Department would use the system so they should pay for it and, to complete the circle, Customer Service says the R&D program should support it. Thus the only progress which is made is that which is bootlegged and mischarged. We must recognize the need for orderly development in this area and fund it with legitimate charge numbers so that priority can be obtained to get the work done.

Charles D. Morgan
Charles D. Morgan

CDH:ac

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To	D. H. ROY, MANAGER, ENGINEERING DEPARTMENT
From	A. S. HELLER, SYSTEM RELIABILITY & CONTROLS - TECH STAFF <i>034</i>
Cust.	File No. or Ref.
Subj.	Date
NRC LETTER OF NOVEMBER 16, 1979 (COPY ATTACHED)	DECEMBER 6, 1979

- References: 1) L. B. Wall, "Probabilistic Risk Assessment in Nuclear Power Plant Regulation", Presented at the Second International Seminar on Structural Reliability of Mechanical Components & Sub-assemblies of Nuclear Power Plants, Berlin, West Germany, August 20, 1979.
- 2) G. F. Malan Trip Report - NRC's CR Study, November 13, 1979.

The attached NRC letter prompts this memo since BSW currently is conducting several projects that have an input to the response we may give to the NRC—helping them to establish "numerical criteria for evaluating public risks from nuclear power plants". We are engaged in developing codes and models for establishing licensability based on design basis events, as the current NRC regulations dictate. The above references as well as the attached letter clearly indicate that the NRC regulations are changing from deterministic to probabilistic, and we must convince the NRC that we are aware of this change and can show that work is under way to support such a change.

As Reference 1 suggests,

"The events at Three Mile Island are evidence of the desirability of a) the systematic evaluation of a broad spectrum of accident sequences, b) the judicious, but effective use of probability, c) an effective operations evaluation function, and d) a realistic probabilistically-based safety goal. These analytical tools can supplement and modify existing deterministic criteria and thereby contribute to:

- focusing design and regulatory attention upon significant issues,
- providing a context within which the significance of operating events can be evaluated,
- providing a flexible safety envelope within which potential safety improvements can be proposed and be assessed, and
- rationalizing and stabilizing the licensing process.

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These improvements should result in a commercial nuclear power plant which imposes less risk to the public and also may be less expensive."

[The author of Reference 1, by the way, is Dr. I. S. Wall who is currently the Program Manager of the Nuclear Safety and Analysis Department of EPRI and until recently was Head of Probabilistic Analysis Staff - NRC from whence the attached letter came. He is in constant communication with the AIF subcommittee on Probabilistic Risk Assessment (PRA) and has been chosen to head the AIF 58.5 PRA subcommittee.]

The NRC work scope (Reference 2) and the aims stated in the attached refer to realistic, probabilistically based safety goals. These can only be achieved with the pursuit of the other three points, a-c, listed above. While we were conducting a systematic investigation of the DNB contributing design parameters under the SCD project for instance, which did lead to realistic and probabilistically based safety goals such as "at least 95/95 probability of no pins in DNB during normal operations" and so on, we are not focusing on a systematic and broad spectrum of events in need of similar investigation.

As a result of TMI and the Kemeny Commission's findings, emphasis has shifted from the design basis events to those leading to core melt; however, the methodology used in SCD is directly applicable.

The essence of the SCD technique is to -

1. Establish reliable inputs and their uncertainties;
2. Develop efficient models;
3. Propagate the input through the models;
4. Determine the best estimate and the uncertainties on the output;
5. Set probabilistic licensing criteria which are defensible.

The above was carried out with regard to DNB as the phenomenon of importance. By shifting the SCD methodology to different phenomena, we can answer the NRC's soon-to-come requirements.

It is suggested that we initiate a systematic investigation of accident sequences that lead to core melt. Since it was established that small LOCA and relatively frequent transients may cause events leading to core melt when system interactions are also considered, we may start with those. It is insufficient just to do a fault tree analysis in itself just as the NRC chooses. Even the same fault tree values differ when various system interactions or event paths are included! Furthermore, the paths for inclusion in a fault tree type analysis may or may not be plant generic. The sensitivities for a given path are certainly plant dependent and some other paths show pertinence when different designs are examined. Without a sensitivity study of a broad scope as outlined above, a risk profile for a plant is of limited value.

DECEMBER 6, 1979

Administrative action for the creation of a task force is hereby suggested, to be led by people with reliability and probability training and experience and to consist of engineers from other sections as necessary. Since our future licensing as well as existing plants are impacted by any design changes the NRC may recommend, we must have a solid defense. There appears to be no other way but to have the authority to do a systematic analysis with knowledgeable B&W people, not outsiders who will make decisions we shall have no control over but will have to live with.

An early response will be appreciated.

ASH:ae

cc: C. D. Morgan
G. F. Malan
W. W. Weaver
J. E. Taylor
R. J. Finnia

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