

December 19, 2000

MEMORANDUM TO: Jack R. Strosnider, Jr., Director
Division of Engineering
Office of Nuclear Reactor Regulation

Farouk Eltawila, Acting Director
Division of Systems Analysis and Regulatory Effectiveness
Office of Nuclear Regulatory Research

Thomas L. King, Director
Division of Risk Analysis and Applications
Office of Nuclear Regulatory Research

FROM: Michael E. Mayfield, Director /RA/ M. Mayfield
Division of Engineering Technology
Office of Nuclear Regulatory Research

SUBJECT: NUREG/GR-0019 "SOFTWARE ENGINEERING MEASURES FOR
PREDICTING SOFTWARE RELIABILITY IN SAFETY CRITICAL
DIGITAL SYSTEMS"

Attached for your information and use is NUREG/GR-0019, which is the University of Maryland's final report evaluating the current state-of-the-art of quantitative measures/metrics for software engineering. The university team reviewed the work performed by Lawrence Livermore National Laboratory and convened an experts workshop in order to gather information on the existing reliability measures. The University ranked the measures based upon the experts responses to a detailed questionnaire. The University developed a new paradigm for using a set of software engineering measures from which the potential reliability of a digital I&C system can be predicted from the set of 30 pre-selected software engineering measures. The 30 measures were categorized according to the four phases of software development-requirements, design, implementation, and testing.

This work was performed per User Need 2000-7 which requests RES to "*provide guidelines that improve the guidance in SRP Chapter 7, Rev. 4, for a more efficient staff review.*" The next steps as defined in Section 3.1.1 of the NRC Research Plan for Digital Instrumentation and Control are to validate the ranking of the measures in a software development setting to ensure method can be of practical use, and to establish baselines which can be used to measure submittal quality.

The existing standard review Plan Chapter 7 and BTP-14, provides guidelines to reviewers for the review of digital instrumentation and control systems. This report provides additional

information to be used by NRC staff and the licensees in the area of prediction of software quality and supports the agency performance goals as follows:

Maintaining Safety - This report provides recommendations for a set of measurements which meets the BTP-14 requirement that the implementation characteristics of the software development plan should include measurements, and requires a set of indicators used to determine the success or failure of the technical aspects of the development process and the resulting design outputs.

Reduce Unnecessary Regulatory Burden - This report provides recommendations for measurements, in all phases of software development, which provides guidance to licensee's as to measurements which should be used to meet BTP-14 measurement requirements.

Improving Regulatory Effectiveness, Efficiency and Realism - BTP-14 requires measurements to be identified during the development process, however, BTP-14 doesn't provide guidance as to which measurements are acceptable. Use of the measurements defined by the report provides acceptable parameters that can be used in technical reviews of proposed license amendments.

This report was reviewed by the Electrical and Instrumentation and Controls Branch of NRR.

Attachment: As stated

information to be used by NRC staff and the licensees in the area of prediction of software quality and supports the agency performance goals as follows:

Maintaining Safety - This report provides recommendations for a set of measurements which meets the BTP-14 requirement that the implementation characteristics of the software development plan should include measurement, and requires a set of indicators used to determine the success or failure of the technical aspects of the development process and the resulting design outputs.

Reduce Unnecessary Regulatory Burden - This report provides recommendations for measurements, in all phases of software development, which provides guidance to licensee's as to measurements which should be used to meet BTP-14 measurement requirements.

Improving Regulatory Effectiveness, Efficiency and Realism - BTP-14 requires measurement to be identified during the development process, however, BTP-14 doesn't provide guidance as to which measurements are acceptable. Use of the measurements defined by the report provides acceptable parameters that can be used in technical reviews of proposed license amendments.

This report was reviewed by the Electrical and Instrumentation and Controls Branch of NRR.

Attachment: As stated

Distribution: See Next Page

***See Previous Concurrence**

DOCUMENT NAME: g:\brill\nureg transmittal letter

OAR in ADAMS? (Y or N) Y ADAMS ACCESSION NO.: ML003779219 TEMPLATE NO. RES-
Publicly Available? (Y or N) Y DATE OF RELEASE TO PUBLIC 12/22/00 SENSITIVE? N
To receive a copy of this document, indicate in the box: "C" = Copy without enclosures "E" = Copy with enclosures "N" = No copy

<input type="checkbox"/>							
<input type="checkbox"/>							
<input type="checkbox"/>							

Distribution:

B. Boger, NRR
J. Calvert, RES
J. Calvo, NRR
M. Chiramal, NRR
J. Kramer, RES
Evangelos Marinos, NRR
J. Rosenthal, RES
Nathan Siu, RES
M. Fields, NRR
E. Thornsby, RES
W. Lanning, RGN-I
A. R. Blough, RGN-I
A. Mallett, RGN-II
J. Globe, RGN-III
G. Grant, RGN-III
A. Howell, RGN-IV
K. Brockman, RGN-IV
ERAB r/f

