



UNITED STATES
NUCLEAR REGULATORY COMMISSION
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January 20, 2023

MEMORANDUM TO: Russell Felts, Director
Office of Nuclear Reactor Regulation
Division of Reactor Oversight

Mike X. Franovich, Director
Office of Nuclear Reactor Regulation
Division of Risk Assessment

FROM: John R Tappert, Director *Christian Araguas* Araguas, Christian signing on behalf
Office of Nuclear Regulatory Research of Tappert, John
Division of Risk Analysis on 01/20/23

SUBJECT: RESEARCH INFORMATION LETTER (RIL 2022-11) "HUMAN
PERFORMANCE TEST FACILITY VOLUMES 1-3".

The Office of Nuclear Regulatory Research (RES) is providing for your information and use Research Information Letter (RIL) report, "Human Performance Test Facility (HPTF) Volumes 1-3" (RIL 2022-11). This series of reports presents several experiments conducted after the Commission, in SRM SECY-08-0195, directed the staff to consider using generic simulator platforms for addressing human performance issues, as simulators provide a tool to gather more empirical nuclear specific human performance data. These experimental data would enhance the current information gathering process, thus providing stronger technical bases and guidance to support regulatory decision making. These reports are also responsive to previous program office requests, specifically, the former Office of New Reactors (NRO) issued a user need for RES to update its human factors engineering (HFE) review guidance with regards to emerging technologies (User Need NRO-2012-007) and more recently the Office of Nuclear Reactor Regulation (NRR) issued a follow-on user need with the same purpose (User Need NRR-2019-008). Additionally, the empirical human performance data collection ensures a better understanding of the various cognitive and physical elements that support safe control room operation

Volume 1, titled "Systematic Human Performance Data Collection Using Nuclear Power Plant Simulator: A Methodology" contains two studies and compares performance, physiological, and subjective measures of workload in operators and novices in a simulated digital representation of an analog plant in both a touchscreen and desktop configuration.

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Volume 2, titled “Comparing Operator Workload and Performance Between Digitized and Analog Simulated Environments” contains a single study and compares formerly licensed operators’ performance, physiological, and subjective workload between a full scale, full scope simulator, and the HPTF’s lightweight digitized simulator environment during an emergency operating procedure scenario.

Volume 3, titled “Supplemental Exploratory Analyses of Sensitivity of Workload Measures” contains a re-analysis of data from volume 1 and 2 with the specific goal of determining sensitivity to workload variations for each of the subjective and physiological measures. Understanding which indices are more and less sensitive to variations in workload will provide useful insights to HF licensing technical staff for their assessment of an applicant’s HFE program (NUREG-0711) and staffing analyses (NUREG-1791). For instance, applicants or licensees typically only use subjective measures of workload to demonstrate successful implementation of some elements of their HFE design program. The NASA-TLX is the most used assessment technique, however, there have been instances of deviation from this precedent. Having a better understanding about which NASA-TLX alternatives are more or less sensitive, and in what context, will aid technical reviewers’ determination as to an applicant’s correct use of the metric(s) chosen. Additionally, studies like Volume 3 aid in understanding the underlying physiological mechanisms that drive the changes in self-assessed workload using subjective measures alone.

Taken together these volumes (1) establish the feasibility of using non-operators for studying task- and rule-based aspects of common main control room actions and (2) the sensitivity, advantages, and limitations of various workload measurement techniques. In particular, the sensitivity assessment is a useful complement to workload guidance in NUREG-0711. The experimental baseline established by the methodology described in these reports will also enhance our ability to gather empirical data in support of future HRA methods development around errors of commission and dependency.

In closing, RES has worked closely with NRR to ensure that the cognizant staff members from each organization were aware of the results of the referenced research and how the products could be applied to ongoing and future regulatory activities prior to transmittal of the final report. We expect that this close working relationship will continue.

RES has established an online quality survey to collect feedback from user offices on the usefulness of RES products and services. This survey can be found online at this [hyperlink](#). RES would appreciate the responsible manager or supervisor completing this short—about 5 minutes—survey within the next 10 working days to present your office’s views of the delivered RES product.

Enclosure:
RIL 2022-11; Human Performance
Test Facility Volume 1-3.

Memo to Russell Felts and Mike Franovich re RIL2022-11 DATE January 20, 2023

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