



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
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January 13, 2022

MEMORANDUM TO: Christopher Regan, Director  
Office of Nuclear Reactor Regulation  
Division of Reactor Oversight

FROM: Mark Thaggard, Director  
Division of Risk Analysis  
Office of Nuclear Regulatory Research

A handwritten signature of Mark Thaggard in black ink, enclosed in a red rectangular box.

Signed by Thaggard, Mark  
on 01/13/22

SUBJECT: RESEARCH INFORMATION LETTER (RIL 2020-06)  
"SAFETY EVALUATIONS OF ADAPTIVE  
AUTOMATION: SUITABILITY OF EXISTING REVIEW  
GUIDANCE"

The Office of Nuclear Regulatory Research (RES) is providing for your information and use Research Information Letter (RIL) report, "Safety Evaluations of Adaptive Automation: Suitability of Existing Review Guidance." (RIL 2020-06). This report presents the suitability of using existing U.S. Nuclear Regulatory Commission Human Factors Engineering guidance to support future safety evaluation reviews that involve adaptive automation (AA) and to identify what additional guidance is needed. This report is intended to be used as a companion piece to previously published, [RIL 2020-05](#), which defined the current state-of-the-art in AA research and application. RIL-2020-06 relies heavily on the results of RIL 2020-05. As part of this project, human factors engineering staff from RES and the Office of Nuclear Reactor Regulation (NRR) coordinated with each other on the review and updates to these reports to ensure value for technical review staff use.

The U.S. Nuclear Regulatory Commission (NRC) staff have identified AA as an advanced technology that impacts operational practices and potentially, plant safety. AA is the dynamic, real-time change in the degree of automation a system employs that is triggered by conditions such as poor task performance and high operator workload. AA has been discussed in the literature as a promising means of mitigating human performance issues that often arise in highly automated systems, such as loss of situation awareness, complacency, and degrading of manual skills. Previously, RIL 2020-05 provided the results of a scoping study aimed to develop the AA characterization and a technical basis that can serve as the foundation for review guidance. The present RIL 2020-06 presents the evaluation of whether the existing NRC human factors engineering guidance (i.e., Human Factors Engineering Program Review Model (NUREG-0711) and Human System Interface Design Review Guidelines (NUREG-0700)) is sufficiently comprehensive to support human factors engineering safety reviews of applications proposing the use of AA. This report also identifies where the guidance is insufficient and identifies what additional guidance is needed.

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The results revealed that the available guidance is sufficient to review some aspects of AA, such as the monitoring of AA systems, detection of AA system failure, and the general evaluation/validation of AA systems. However, there are numerous areas where the guidance is insufficient to review the unique design characteristics of AA systems, such as the design of AA configurations and triggering conditions. This RIL allows the NRC staff to understand when existing NRC guidance is sufficiently comprehensive for use on future applications proposing to use AA systems and identifies gaps and areas where additional research is needed to provide more comprehensive guidance for use when evaluating these unique characteristics of AA systems.

RES has worked closely with NRR to ensure that the cognizant staff members from each organization were satisfied with the quality and completeness of the work products 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 2020-06; Safety Evaluations  
of Adaptive Automation: Suitability  
of Existing Review Guidance

Memo to Christopher Regan - RIL-2020-06 DATE January 13, 2022

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