UNITED STATES
NUCLEAR REGULATORY COMMISSION
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September 2, 2022

MEMORANDUM TO: Louise Lund, Director
Division of Engineering
Office of Nuclear Regulatory Research

FROM: Raj Iyengar, Chief
Reactor Engineering Branch
Division of Engineering
Office of Nuclear Regulatory Research

Signed by Iyengar, Raj
on 09/02/22

SUBJECT: CLOSE-OUT OF THE FUTURE-FOCUSED RESEARCH PROJECT ON DIGITAL TWIN REGULATORY VIABILITY AND ISSUANCE OF TWO TECHNICAL LETTER REPORTS

The purpose of this memorandum is to document the close-out of the future-focused research (FFR) project on "Digital Twins – Regulatory Viability." This project was one of six research proposals selected when the FFR program began in FY2020. Due to the potential of digital twins (DTs) and DT-enabling technologies to affect the current and future fleet, the project was initiated to assess technical and regulatory challenges regarding the use of DTs in nuclear power plants (NPPs), fuel cycle facilities, and other nuclear energy applications.

Included in the close-out memorandum, RES/DE/REB is pleased to issue two technical letter reports (TLRs) entitled "Regulatory Considerations for Nuclear Energy Applications of Digital Twin Technologies" (ADAMS Accession ML22192A046) and "Project Summary of Digital Twin Regulatory Viability in Nuclear Energy Applications" (ADAMS Accession ML22235A643). These reports aim to increase knowledge, enhance communication, and build common understanding of DT applications in NPPs.

TLR-RES/DE/REB-2022-06 explores the potential impact of DT technologies on NRC-regulated activities. The report describes a nuclear DT system and its capabilities for NPP applications, followed by identification and discussion of some regulated activities that merit special consideration and present opportunities in implementing DT-enabling technologies and capabilities. The report presents a list of regulated activities with respect to the five main components of the NRC's regulatory processes: Regulations and Guidance; Licensing, Decommissioning and Certification; Oversight; Operational Experience; and Support for Decisions.

TLR-RES/DE/REB-2022-07 presents a summary of activities, insights, and outcomes of the NRC's FFR project aimed at assessing the regulatory viability of DT technologies. The project activities included conducting a comprehensive state of technology assessment of DT-enabling technologies, engaging stakeholders in the form of workshops and public meetings, identifying challenges and gaps in the application of DT-enabling technologies, and identifying areas that may benefit from future regulatory focus.

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In addition to the two above-mentioned TLRs, the project team has issued two research information letters (RILs) documenting workshop proceedings, one report summarizing an observation public meeting, and two TLRs providing detailed discussions on the state of technology and technical challenges with DTs. A complete list of deliverables is provided in the enclosure.

Enclosures:
1. Digital Twin FFR Project Deliverables
2. TLR-RES/DE/REB-2022-06, “Regulatory Considerations for Nuclear Energy Applications of Digital Twin Technologies”
3. TLR-RES/DE/REB-2022-07, “Project Summary of Digital Twin Regulatory Viability in Nuclear Energy Applications”

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ADAMS Package Accession No.: ML22235A659 *Concurred via Email

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DATE	/ /2022	/ /2022

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Digital Twin FFR Project Deliverables

Deliverable(s)	Deliverable Title	Deliverable Date	ADAMS No.
TLR	TLR-RES/DE/REB-2021-01 "The State of Technology of Application of Digital Twins"	June 2021	ML21160A074
	TLR-RES/DE/REB-2021-17 "Technical Challenges and Gaps in Digital-Twin-Enabling Technologies for Nuclear Reactor Application"	December 2021	ML21361A261
	TLR-RES/DE/REB-2022-06 "Regulatory Considerations for Nuclear Energy Applications of Digital Twin Technologies"	August 2022	ML22192A046
	TLR-RES/DE/REB-2022-07 "Project Summary of Digital Twin Regulatory Viability in Nuclear Energy Applications"	August 2022	ML22235A643
RIL	RIL 2021-02 "Proceedings of the Workshop on Digital Twin Applications for Advanced Nuclear Technologies"	March 2021	ML21083A132
	RIL 2021-16 "Proceedings of the Workshop on Enabling Technologies for Digital Twin Applications for Advanced Reactors and Plant Modernization"	December 2021	ML21348A020
Public Meeting Summary	"Summary of the Observation Public Meeting on Regulatory Considerations and Opportunities for Digital Twins in Nuclear Reactor Applications"	March 2022	ML22091A007
Advisory Committee on Reactor Safeguards (ACRS) Briefing	Digital Twins Information Briefing - Official Transcript of Proceedings (pp. 75-220)	May 2022	ML22179A369
2022 Regulatory Information Conference (RIC) Video Presentation	"NRC Digital Twins – Regulatory Viability" YouTube Link	March 2022	ML22179A224

Regulatory Considerations and Summary Report for Digital Twin Future Focused Research Project DATE September 2, 2022

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