



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

July 13, 2018

MEMORANDUM TO: Terry W. Jackson, Chief
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Division of Construction Inspection
and Operational Programs
Office of New Reactors

FROM: Nicholas Savwoir, Reactor Operations Engineer /RA/
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SUBJECT: SUMMARY OF THE NUCLEAR REGULATORY COMMISSION
WORKSHOP ON VENDOR OVERSIGHT

On June 14, 2018, the Office of New Reactors (NRO), Division of Construction Inspection and Operational Programs (DCIP), hosted the Nuclear Regulatory Commission (NRC) Workshop on Vendor Oversight in Cleveland, Ohio. This workshop followed the Nuclear Procurement Issues Committee (NUPIC) vendor meeting to enable maximum participation by suppliers to the nuclear industry. The NRC Vendor Workshop included a keynote address by NRC Commissioner Stephen G. Burns, as well as presentations by members of the NRC staff, NUPIC, the Electric Power Research Institute (EPRI), National Institute of Standards and Technology, National Intellectual Property Rights Coordination Center, reactor licensees and nuclear vendors. This was the 6th Workshop on Vendor Oversight.

The Workshop on Vendor Oversight included a plenary session on such issues as safety conscious work environment (SCWE); reverse engineering; counterfeit, fraudulent, and suspect items (CFSI); and recent supplier oversight issues. The workshop also included afternoon panel discussions regarding commercial-grade dedication (CGD) topics and additive manufacturing as related to the nuclear industry.

The audience included approximately 400 attendees representing companies and organizations from 14 countries including vendors, industry groups, government regulatory agencies, and both foreign and domestic utilities.

A list of attendees is provided in Enclosure 1. The list of speakers is provided in Enclosure 2. All presentations are available in the NRC's Agencywide Documents Access and Management

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System (ADAMS) at accession numbers in Enclosure 3. The presentations are also available on the NRC public website at <http://www.nrc.gov/reactors/new-reactors/oversight/quality-assurance/vendor-oversight.html>.

Morning Plenary Session

Mr. Terry Jackson, Chief, Quality Assurance Vendor Inspection Branch-1 (QVIB-1), moderated the plenary session, provided opening remarks, introduced the speakers of the plenary session and welcomed remote attendees via the telephone bridge-line.

Mr. Paul Krohn, Deputy Director, DCIP, welcomed the attendees of the 2018 Workshop and provided remarks about the NRC's mission and principles of good regulation, as well as the importance of the nuclear supply chain and maintaining a learning organization.

Commissioner Stephen Burns provided the keynote address from his perspective starting at the NRC almost 40 years ago. He provided remarks regarding the state of the operating fleet to information about new and advanced reactors. He stated that over the last three and half years the operating fleet has shown strong performance indicators, despite recent trends toward plants intending to shut down operations. He also provided remarks on the cancellation of V.C. Summer and noted the new opportunities for vendors with the NuScale design application, the ongoing review of the Clinch River small modular reactor early site permit application, and the vision for an improved licensing framework for advanced reactors. Commissioner Burns also remarked on the importance of vendor oversight and maintaining an open dialogue, given the significant role that vendors play in nuclear safety in the U.S. and abroad. He mentioned safety culture, SCWE, and the NRC's newly revised brochure on safety culture. He also touched on industry challenges in the 1960s through the 1980s which highlighted the need for increased oversight of vendors and how we are finding the need to re-learn some of those lessons to re-emphasize quality assurance (QA) today. The Commissioner encouraged vendor workshop discussions and urged vendors to embrace the overall shared goal of nuclear safety and security.

Ms. Diane Sieracki, Senior Safety Culture Program Manager, and Mr. Paul Prescott, Senior Reactor Operations Engineer, both from the NRC, provided a discussion of safety culture and SCWE. Ms. Sieracki informed the audience of the updated NRC brochure on safety culture and indicated that, although the NRC policy on safety culture is not a regulation, it is a collective commitment which should include suppliers and vendors. She mentioned the NRC public website includes tools such as the "Trait Talk" workbook, which organizations can use to encourage continuous learning and responsibility. Mr. Prescott continued by mentioning that safety culture does enhance overall quality by attempting to correct root causes. He discussed how poor safety culture can cause recurring quality problems and NRC enforcement action, as shown by recent examples discussed in the meeting.

Mr. Marc Tannenbaum, Technical Executive, EPRI, discussed reverse engineering and EPRI's updated guidance on reverse engineering. Mr. Tannenbaum spoke on the importance of equivalency evaluations and the risk associated with attempting to reverse engineer without having access to all the previous design information. Mr. Tannenbaum noted advanced technology, such as additive manufacturing and laser measurement scanning, provide tools to assist vendors in successful reverse engineering projects. Mr. Tannenbaum highlighted that, similar to CGD, documenting design information in the reverse engineering process is essential.

Ms. Diana Clemmons, National Program Manager, National Intellectual Property Rights Coordination Center, provided a law enforcement perspective on CFSI. She emphasized that with such a high potential for illicit money making and an increase in CFSI activities, stronger enforcement and penalties for counterfeiting are needed worldwide for CFSI, which includes products ranging from personal care products to machined parts and devices. She noted that smaller counterfeiting can become a gateway for criminal organizations to expand CFSI into heavier commercial and industrial areas that could potentially affect the nuclear industry. Ms. Clemmons shared information on efforts to collaborate among federal agencies to counter CFSI in military information technology (IT) procurements, which included falsified testing and shipping declarations.

Mr. Yamir Diaz-Castillo, Reactor Operations Engineer, NRC, closed the morning session with a presentation on the recent increase of NRC inspection findings in the areas of procurement and oversight of suppliers. Mr. Diaz-Castillo emphasized that both Title 10 of the *Code of Federal Regulations* (10 CFR), Part 21, and 10 CFR Part 50, Appendix B, need to be specified when procuring from domestic or international suppliers who are supplying basic components¹. He noted that a revised Regulatory Issue Summary (RIS) is in the process of being issued to remind the industry of these requirements as well as provide further information regarding the increase in these findings.

Panel Session A: Commercial-Grade Dedication Issues

Mr. Richard McIntyre, Senior Reactor Operations Engineer, NRC, moderated the session, provided opening remarks; and introduced the speakers for the first afternoon panel session.

Mr. Douglas VanTassell, CEO, Paragon Energy Solutions, discussed software dedication with respect to process control software and design and analysis computer programs.

Mr. VanTassell indicated their biggest challenge is access to design requirements. From utilities, they need information regarding the safety function, qualification parameters and requirements, design attributes, and up-to-date information in purchase orders. From the original equipment manufacturers, it is difficult to get design information due to proprietary protection, obsolescence, and design information not kept up-to-date.

Mr. Jonathan Ortega-Luciano, Reactor Operations Engineer, NRC, provided a presentation on sampling procured items with regards to CGD. Mr. Ortega-Luciano indicated that engineering staff should be involved in evaluations and the basis for the sampling process should be well documented. Using recent examples, he highlighted the importance of providing a documented, well-developed engineering evaluation as the basis for sampling.

Mr. Marc Tannenbaum, Technical Executive, EPRI, and Mr. John Simmons, Consulting Auditor, Luminant Power, presented the historical background on 10 CFR Part 50, Appendix B, and the basis for CGD in 10 CFR Part 21 and 10 CFR Part 50, Appendix B. Mr. Tannenbaum expressed that CGD is an alternative process for accepting and ensuring quality assurance. He

¹ Basic component is defined in 10 CFR Part 21 as a structure, system, or component, or part thereof that affects its safety function necessary to assure: (A) The integrity of the reactor coolant pressure boundary; (B) The capability to shut down the reactor and maintain it in a safe-shut down condition; or (C) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures. Basic components are items designed and manufactured under a quality assurance program complying with 10 CFR Part 50, Appendix B, or commercial grade items which have successfully completed the dedication process.

also noted that dedication is not a shortcut and the basis of the four methods is found in Criterion VII of 10 CFR Part 50, Appendix B. Mr. Simmons discussed how CGD, as a process, is intended to provide “adequate confidence” or “reasonable assurance” that the dedication is “equivalent to” an item designed and manufactured under a 10 CFR Part 50, Appendix B, quality assurance program. Mr. Tannenbaum highlighted important aspects to consider when determining whether to procure an item that was designed and manufactured to a quality assurance program meeting 10 CFR Part 50, Appendix B, or to procure the item as commercial grade and perform CGD.

Panel Session B: Additive Manufacturing

Mr. John Burke, Senior Reactor Operations Engineer, NRC, moderated the session, provided opening remarks, and introduced the speakers for the second afternoon panel session.

Ms. Paula Freyer, Fellow Engineer/Metallurgist, Westinghouse, described her research on the metallurgical properties of test specimens created with metal additive manufacturing. Specifically, the testing involved irradiating test specimens in a research reactor in a time-intensive process. They discovered that additive manufacturing can produce drastically different microstructures with improved strength and ductility. Ms. Freyer described their testing process using a hot cell facility to handle the irradiated samples and proposed avenues for further exploration.

Dr. Francisco Medina, Additive Manufacturing Director, Edison Welding Institute, described the various additive manufacturing techniques, some of which are suitable for thermoplastics or metals. Dr. Medina recognized the type of components that can be created with additive manufacturing, as well as their properties, depends on the particular technology. Dr. Medina outlined some considerations and limitations of different technologies and noted that tooling and prototyping are common uses, particularly in the medical and aerospace fields.

Mr. Kevin Jurrens, Deputy Chief - Intelligent Systems Division Engineering Laboratory, National Institute of Standards and Technology (NIST), presented a high-level summary of NIST’s research, as well as a status on standards activities. NIST’s role is historically in the technical domain; providing the basis for new standards. Mr. Jurrens believes there will be growth and additional commercialization of additive manufacturing techniques. He also indicated that NIST is developing standardized test blocks to allow standard comparisons among additive techniques. As the standards are new, NIST is working with organizations such as ANSI, ASTM, and ISO to create reference standards.

Ms. Amy Hull, Senior Materials Engineer, NRC, noted that NRC’s Office of Nuclear Regulatory Research is attempting to implement NRC’s transformation initiatives; moving away from (reactive) confirmatory activities to (proactive) anticipatory technology. Ms. Hull mentioned an ASTM terminology document from 2012 is being revised due to changing technologies. NUREG-CP-310 discusses the proceedings of NRC’s most recent additive manufacturing conference. In addition, RIS 2017-08 is planned to be revised to address potential additive manufacturing that new reactor applicants may use in the future.

NRC Regulatory Updates and Closing Remarks

Mr. Terry Jackson provided a brief regulatory update, gave closing remarks, and opened the floor for questions to be answered by senior vendor inspectors.

Mr. Jackson discussed the recent issuance of the following regulatory guides:

- RG 1.231: “Acceptance of Commercial-Grade Design and Analysis Computer Programs Used in Safety-Related Applications for Nuclear Power Plants”, January 2017, Revision 0 (original issue)
- RG 1.164: “Dedication of Commercial-Grade Items for Use in Nuclear Power Plants”, June 2017, Revision 0 (original issue)
- RG 1.28: “Quality Assurance Program Criteria (Design and Construction)”, October 2017, Revision 5
- RG 1.234: “Evaluating Deviations and Reporting Defects and Noncompliance Under 10 CFR Part 21”, April 2018, Revision 0 (original issue)
- Forthcoming RIS regarding oversight of suppliers

Summary and Conclusions

Several key messages were developed from the interactions during the workshop:

- Rigorous quality assurance and vendor oversight is important to maintaining the integrity of the global supply chain and nuclear safety. The primary responsibility for oversight lies with licensees and vendors with regards to their suppliers.
- Safety culture enhances overall quality by attempting to correct root causes. Poor safety culture can cause recurring quality problems and result in NRC enforcement action. A robust and positive safety culture promotes quality in the global supply chain.
- Reverse-engineering techniques involve examining an existing specimen as well as review and analysis of information available about the item’s design and its design functions to enable manufacturing or otherwise facilitate acquisition of the item. Equivalency evaluations and risk are inherent in attempting reverse engineering techniques, particularly without having access to all the previous design information.
- Ensure 10 CFR Part 50, Appendix B, and 10 CFR Part 21 are imposed in procurement documents. Otherwise, the procurement is not different from procuring a commercial grade item.
- Vigilance is key in preventing the entry of counterfeit, fraudulent, and suspect items into the global supply chain. The effectiveness of a resilient infrastructure or enterprise depends upon its ability to anticipate, absorb, adapt to, and/or rapidly recover from a potentially disruptive event.
- It is important to provide an adequate engineering basis for the sampling process, as well as making sure to document it. Similarly, it is important to document the design information and decisions made in the reverse engineering process.
- Advanced manufacturing has been identified as an area of potential future utilization by the nuclear industry. The NRC has an action plan to address this new technology.

Consistent with the previous vendor workshops, the NRC staff received over 100 questions throughout the day and responded to these questions during the designated question and answer time, as well as the final plenary session at the close of the workshop. Interested parties who sought further clarification on any of the topics discussed during the workshop were encouraged to utilize the Frequently Asked Questions section of the NRC public website, or to contact Nicholas Savwoir at Nicholas.Savwoir@nrc.gov to solicit more detailed responses.

In an effort to enhance the next vendor workshop, the NRC solicited suggestions from the attendees. The NRC included a solicitation for suggested topics at future workshops in the workshop program. NRC Public Meeting Feedback forms were also distributed to attendees, and a number of public meeting feedback forms were received at the close of the workshop. In general, the attendees expressed interest in the NRC's continued conduct of similar outreach activities and suggested that the NRC continue to coordinate its workshop with the annual NUPIC Vendor Meeting. Additional feedback forms are expected by mail. These feedback forms will be used to improve future vendor workshops and to focus on the appropriate topics at future workshops.

In summary, the workshop brought together regulated utilities, government agencies, nuclear component vendors, and other interested stakeholders to discuss such issues as vendor oversight for SCWE, reverse engineering, CFSI, CGD; and advance/additive manufacturing.

Enclosures:

1. List of Attendees
2. List of Speakers
3. List of Presentations

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ON VENDOR OVERSIGHT Dated: July 13, 2018

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NRC Workshop on Vendor Oversight
June 14, 2018

Registered Attendee List

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Adam	Tamilia	Westinghouse	USA
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Aleks	Lulgjuraj	Curtiss-Wright	USA
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Alex	Jackson	Weldstar Co.	USA
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Alnoor	Bhaloo	Nawah Energy Company	United Arab Emirates
Amie	Humphrey Facendola	Alden Research Laboratory	USA
Amy	Macco	Energy Steel	USA
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Andres	Torralba	Iberdrola	Spain
Andrew	Bowman	Westinghouse	USA
Andrew	Hayworth	Orrvilon Inc.	USA
Angela	Zubroski	Westinghouse	USA
Anna	McLenden	Nuscale Power LLC	USA
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Brian	Bimm	Canadian Nuclear Laboratories	Canada
Brian	Roberts	Westinghouse	USA

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Carmen	Alonso	GE Hitachi	USA
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Charles	Brown	Duke Energy	USA
Charles	Elias	Pennatronics	USA
Chien-An	Lin	Taiwan Power Company	Taiwan
Chris	Alar	Super Radiator Coils	USA
Chris	Harper	Sulzer Pumps	USA
Chris	Iserl	AAF International	USA
Chris	Lee	Canadian Nuclear Laboratories	Canada
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Christina	Pfingsten	Carboline	USA
Christopher	Kulwicki	Kinetix Quality Services	USA
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Michael	Corbin	PPG/PMC	USA
Michael	Dunkelberger	MPR	USA
Michael	Gilman	AECOM	USA
Michael	Gordon	Consumers Energy	USA
Michael	Jasurda	APS	USA
Michael	Kirkland	Energy Steel	USA
Michael	Hedden	Dominion Energy	USA
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Paul	Hogan	Rolls-Royce Nuclear Engineering Services	USA
Paul	Macuiba	Exelon Generation	USA
Paul	Prescott	NRC	USA
Paul	Pridemore	BASF	USA
Paul	Robinson	AMETEK Solidstate Controls	USA
Paul	Thompson	Garlock	USA
Paul	Vinyard	Newport News Industrial	USA
Peter	Blattner	KTA-TATOR	USA
Peter	Schultz	Canadian Nuclear Safety Commission	Canada
Peter	Wenaweser	Hilti Corp.	USA
Philip	Natividad	NRC	USA
Rachel	Kelley Czuba	Sonic Systems International USA	USA
Rachel	Sczurek	Anvil International EPS	USA
Rahoul	Bhagat	Evoqua Water Technologies	USA
Ramon	Alvarado	CFE Laguna Verde Mexico	Mexico
Randall	Kurtz	Sargent & Lundy	USA
Randy	Hugenroth	Omaha Public Power	USA
Randy	Ivey	Westinghouse Electric Company	USA
Randy	Lee	Energy Steel	USA
Randy	Reynolds	Switchgear Solutions	USA
Rebecca	Bay	Bechtel Plant Machinery, Inc.	USA
Rebecca	White	Westinghouse	USA
Rebekah	Needham	Ametek Solidstate Controls	

Reed	Call	ASCO Inc.	USA
Regis	Geister III	Lincoln Electric	USA
Rene	Delaney	Lightbridge Corporation	USA
Richard	DiLorenzo	The Okonite Company	USA
Richard	Buechler	Southern Nuclear Company	USA
Richard	Faulkenburg	Global Quality Assurance Inc.	USA
Richard	Hodom	Turner Industries Group LLC	USA
Richard	Knott	Paragon Energy Solutions	USA
Richard	Rasmussen	Conger & Elsea	USA
Richard	Kuntz	SPX FLOW Copes- Vulcan Operation	USA
Richard	McIntyre	NRC	USA
Ricardo	Mueller	Eugen Seitz AG	Switzerland
Rick	Easterling	Westinghouse	USA
Rick	Denton	WCNOC	USA
Rob	Templeton	Ontario Power Generation	Canada
Robert	Bunz	Omaha Public Power	USA
Robert	Lunsford	ITT	USA
Robert	Paton	Energy Steel	USA
Robert	Phillips	Westinghouse	USA
Robert	Seipel	TVA	USA
Robert	Parrott	Mesa Associates, Inc.	USA
Robert	Villegas	Electric Power Research Institute	USA
Roberto	Rivera	NextEra Energy	USA
Rod	Cude	Southern Nuclear	USA
Roger	Mills	PSEG Nuclear, LLC	USA
Ron	Detwiler	TVA	USA
Rosalie	Nava	Curtiss-Wright	USA
Ryan	Joschak	Framatome Inc.	USA
Saeed	Ali	Nawah Energy Company	United Arab Emirates
Sam	Yousif	Dynamic Solutions USA, Inc.	USA
Samuel	Moore	Joseph Oat Corporation USA	USA
Sara	Roos	SOR Incorporated USA	USA
Sarah	Berardini	Archon Engineering	USA
Sarah	Costello	LPI, Inc.	USA
Satoshi	Hirasawa	JAPAN NUS Co., Ltd.	Japan
Scott	Anderson	BHGE	USA
Scott	McMullen	Bergen Pipe Supports Inc.	USA
Scott	Borland	HydroAire Service, Inc.	USA
Sean	Curran	Dresser, LLC	USA

Sean	Gullo	Consolidated Power Supply	USA
Shad	Wetzel	Turner Industries Group, LLC	USA
Sham	Beri	Trojan Nuclear Plant	USA
Spencer	Bowen	Integrated Power Services	USA
Stanley	Griffin	GE Hitachi Nuclear Energy	USA
Stephen G.	Burns	NRC	USA
Steve	George	DP Engineering	USA
Steve	Grover	Fusion Babbiting Co., Inc.	USA
Steve	Ferrar	Curtiss-Wright/Farris	Canada
Steven	DiMauro	C&D Technologies	USA
Steven	Braun	BNL Industries, Inc.	USA
Stew	Shannon	Curtiss-Wright	USA
Sunmin	HWANG	KINS	South Korea
Sunny	Catalano	Turner Industries Group	USA
Susumu	Itoh	Toshiba	Japan
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Taylor	Lamb	NRC	USA
Terence	Malloy	ABB	USA
Terry	Casteel	Toshiba America Nuclear Energy	USA
Terry	Krause	Burns & McDonnell	USA
Terry	Jackson	NRC	USA
Thomas	Collins	Cives Steel	USA
Thomas	Herritty	NRC	USA
Thomas	Horan	Hilti Inc.	USA
Thomas	Lippucci	Swagelok	USA
Thomas	Paserba	IQC Inc	USA
Thomas	Stomberski	Schneider Electric - Gutor Technology	Switzerland
Tim	Franchuk	Curtiss-Wright	USA
Tim	Nuoffer	The Hartford Steam Boiler Inspection & Insurance Co.	USA
Tim	Roberts	Technology for Energy Corporation	USA
Tim	Weber	DuBose National Energy Services	USA
Timothy	Czuba	Entergy	USA
Timothy	Keller	NUCON International, Inc.	USA
Todd	Reynolds	Ultra Electronics, NSPI	USA
Tom	Cannon	Bruce Power LP	Canada
Tom	DeVincentis	Archon Engineering	USA
Tom	Sharp	Mackson Nuclear LLC.	USA

Toni	Sakadales	NRC	
Tony	Newara	Electric Materials	USA
Tracey	Hager	EnerSys	
Tracy	Honeycutt	Southern Nuclear	USA
Treva	Janzow	Frontier Technology Corp.	USA
Troy	Wetzel	American Crane & Equipment Corp	USA
Vernon	Jensen	Lettis Consultants International, Inc.	USA
Victor	Pina	Electronuclear Brazil	Brazil
Victor	Romano	ABB EPDS Service	USA
Vince	Chermak	Curtiss-Wright/Scientech	USA
Walter	Knox	Gerdau	USA
Wilbert	Meadows	Flowserve	USA
Wilfrid	Bagley	Aecon Industrial	Canada
William	Coll	FirstEnergy Nuclear Operating Co.	USA
William	Ross	EnerSys	USA
William	Ware	Southern Nuclear Operating Co.	USA
Yamir	Diaz-Castillo	NRC	USA
Zach	Mailahn	Emerson	USA

List of Speakers

Speaker	Affiliation
Stephen G. Burns	U.S. Nuclear Regulatory Commission
Paul Krohn	U.S. Nuclear Regulatory Commission
Terry Jackson	U.S. Nuclear Regulatory Commission
Paul Prescott	U.S. Nuclear Regulatory Commission
Diane Sieracki	U.S. Nuclear Regulatory Commission
Richard McIntyre	U.S. Nuclear Regulatory Commission
Jonathan Ortega-Luciano	U.S. Nuclear Regulatory Commission
Yamir Diaz-Castillo	U.S. Nuclear Regulatory Commission
John Burke	U.S. Nuclear Regulatory Commission
Amy Hull	U.S. Nuclear Regulatory Commission
Paula Freyer	Westinghouse
Marc Tannenbaum	Electric Power Research Institute
Diana Clemmons	National Intellectual Property Rights Coordination Center
John Simmons	Luminant Power
Douglas VanTassell	Paragon Energy Solutions
Francisco Medina	Edison Welding Institute
Kevin Jurrens	National Institute of Standards and Technology

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