U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Advanced Manufacturing Office

Smart Manufacturing Industry Day: Workshop Proceedings

February 25, 2015

Atlanta, GA

The DOE Office of Energy Efficiency and Renewable Energy (EERE)'s Advanced Manufacturing Office partners with industry, small business, universities, and other stakeholders to identify and invest in emerging technologies with the potential to create high-quality domestic manufacturing jobs and enhance the global competitiveness of the United States.

This document was prepared for DOE/EERE's AMO by Energetics Incorporated, Columbia, MD.

Disclaimer

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EVENT OVERVIEW

The U.S. Department of Energy's (DOE's) Advanced Manufacturing Office (AMO) held a Smart Manufacturing Industry Day on February 25, 2015, at the Georgia Tech Hotel and Conference Center in Atlanta, Georgia. Smart Manufacturing: Advanced Sensors, Control, Platforms, and Modeling for Manufacturing (referred to herein as Smart Manufacturing) represents an emerging broad opportunity for the U.S. manufacturing sector. Smart Manufacturing is a network data-driven process that combines innovative automation and advanced sensing and control. Smart Manufacturing can integrate manufacturing intelligence in real-time across an entire production operation while minimizing energy, material use, and costs. Smart Manufacturing was identified by private sector and university leaders in the White House's Advanced Manufacturing Partnership 2.0 report as one of the highest priority manufacturing technology areas in need of federal investment.

The Smart Manufacturing Industry Day was a follow-up to the Notice of Intent (NOI) that DOE posted on December, 11, 2014, regarding a potential Funding Opportunity Announcement (FOA) for a "Clean Energy Manufacturing Innovation Institute on Smart Manufacturing: Advanced Sensors, Controls, Platforms and Modeling for Manufacturing." This DOE NOI can be accessed from http://energy.gov/eere/amo/articles/notice-intent-noi-clean-energy-manufacturing-innovation-institute-smart.

At the workshop, participants heard presentations from DOE officials about a potential Smart Manufacturing Institute, including the potential framework, specific technical topic areas of interest, and contracting process and requirements for working with the DOE. Copies of these presentations are available for download from http://energy.gov/eere/amo/downloads/smart-manufacturing-institute-industry-day-workshop. The Industry Day also provided stakeholders with the opportunity to ask questions about this Clean Energy Manufacturing Innovation Institute as well as to have networking discussions with colleagues.

Industry Day participation was voluntary and for information purposes only. Attendance was not a prerequisite for submitting future applications. Specific details regarding submittal of applications will be detailed in the anticipated FOA.

A brief summary of event activities, along with the questions, are presented in these proceedings. The Appendix includes the final agenda, a list of registered participants, and an acronym list.

1. EVENT BACKGROUND AND ACTIVITIES

Background

The President of the United States launched the National Network for Manufacturing Innovation (NNMI) as a major new initiative focused on strengthening the innovation, performance, competitiveness, and job-creating power of U.S. manufacturing (see www.manufacturing.gov). This initiative is providing the required innovation ecosystem to help bridge the gap between basic research and product development/fielding. It provides shared assets to help companies, particularly small and medium enterprises, access cutting-edge capabilities and equipment and creates an unparalleled environment to educate and train the workforce for advanced manufacturing implementation. As part of the NNMI, federal agencies are establishing new NNMI Institutes to fill the gaps in the innovation infrastructure.

Within DOE, AMO invests in cost-shared research, development and demonstration (RD&D) of innovative, next generation manufacturing processes and production technologies that will improve efficiency and reduce emissions, reduce industrial waste, and reduce the life-cycle energy consumption of manufactured products. The results of this investment include having manufacturing energy efficiency harnessed as a competitive advantage, and cutting-edge clean energy products competitively manufactured in the United States. AMO is particularly interested in the challenges associated with advanced manufacturing technology that might be overcome by pre-competitive collaborations conducted via a NNMI Clean Energy Manufacturing Innovation Institute.

Smart Manufacturing: Advanced Sensors, Control, Platforms, and Modeling for Manufacturing (referred to herein as Smart Manufacturing) represents an emerging broad opportunity for the U.S. manufacturing sector. Smart Manufacturing is a network data-driven process that combines innovative automation and advanced sensing and control. Smart Manufacturing can integrate manufacturing intelligence in real-time across an entire production operation while minimizing energy, material use, and costs. Smart Manufacturing was identified by private sector and university leaders in the White House's Advanced Manufacturing Partnership 2.0 report as one of the highest priority manufacturing technology areas in need of federal investment. The Smart Manufacturing Industry Day was a follow-up to the Notice of Intent (NOI) that DOE posted on December, 11, 2014, regarding a potential Funding Opportunity Announcement (FOA) for a "Clean Energy Manufacturing Innovation Institute on Smart Manufacturing: Advanced Sensors, Controls, Platforms and Modeling for Manufacturing."

Event Activities

The event began with an overview and welcome by Mark Shuart, Program Manager in DOE-AMO. Mark Johnson, Director of DOE-AMO, provided remarks about the DOE-AMO Office and presented "NNMI Industry Day: Smart Manufacturing AMO Overview." Director Johnson's presentation provided a summary of key trends and issues in clean energy and advanced manufacturing, a cursory review of energy use in the manufacturing sector, a description of key AMO R&D activities including the two Clean Energy Manufacturing Innovation Institutes previously announced, an overview of the opportunity areas and planning activities which led to the NOI for a Smart Manufacturing Institute, issues and adoption challenges in technical areas of potential interest, and a comparison of the Smart Manufacturing topic area with the existing Digital Manufacturing and Design Innovation Institute led by the Department of Defense. At the conclusion of his remarks, Director Johnson briefly addressed questions from participants.

Isaac Chan, Program Manager in DOE-AMO, then presented "Smart Manufacturing Innovation Institute: Overview, Goals and Activities." This presentation included further information and background about the Institute and technology area, anticipated goals and objectives for the Institute, potential technical areas of interest, anticipated FOA proposal technical volume requirements and evaluation criteria, and special considerations and the anticipated FOA timeline.

After a break, Kristen Cadigan from the DOE Golden Field Office presented "Working with DOE on Clean Energy Manufacturing Innovation Institutes." This presentation included details regarding the timeline and registration/submission requirements, anticipated FOA content and the availability of a teaming list, the requirement of Concept Papers and Full Applications, the evaluation and selection process, cost-sharing, and the expectation of DOE having substantial involvement for any award. Participants were encouraged to review the prior DOE Institute FOA focused on polymer composites as a procedural guide until the Smart Manufacturing Institute FOA is released. It was stressed that if any inconsistencies exist between the Smart Manufacturing FOA and presentations or statements from DOE personnel made at the Industry Day event, the Smart Manufacturing FOA would be the controlling document and applicants should rely on the FOA language and seek clarification from EERE once it is issued.

Final PowerPoint presentations for all three presenters are available on the workshop webpage at http://www.energy.gov/eere/amo/downloads/smart-manufacturing-institute-industry-day-workshop. After the presentations by DOE staff, the attendees participated in a networking break before reconvening for a Question & Answer (Q&A) session.

The Q&A session was facilitated by Mark Shuart and allowed DOE to provide preliminary answers for written questions submitted during the break. A full list of questions along with responses is provided in the Appendix. It is anticipated the Q&A will also be provided as an addendum to the anticipated FOA. DOE staff also indicated there will be other opportunities for interested parties to submit questions and that DOE will continue to answer questions following standard procedures. When the anticipated FOA is released, there will be a webinar that will give interested parties an opportunity to ask questions.

Interested parties will have other opportunities to ask additional questions. The FOA will provide guidance for submitting additional questions.

The workshop was adjourned by Mark Shuart following the Q&A session. Participants were welcome to continue informal networking discussions during the afternoon.

2. PARTICIPANT QUESTIONS

Questions and Answers

The following is a summary of questions submitted to the DOE staff during the Smart Manufacturing Industry Day event, with formal responses to each question. These answers may differ somewhat than those provided at the event.

Questions posed by participants in written format:

Q1: What is the relationship between the Institute and ARPA-E program?

A1: AMO, including the Institutes it funds, and ARPA-E are two separate programs within the purview of the Department of Energy. While there are formal and informal interactions between these programs, they operate independently.

Q2: Can we still be competitive with a bid that is less than $70 million?

A2: Each applicant determines what to submit. The purpose of the FOA is to seek applications from all interested and eligible entities to address the objectives and goals of the FOA; the specific technical topics of interest will be described in the FOA, as will application areas of particular emphasis, if any. DOE will not provide any recommendations prior to submission of an applicant Concept Paper. At that time, DOE makes an independent assessment of each Concept Paper based on the evaluation criteria included in the FOA and will provide guidance to Applicants for consideration prior to submitting Full Applications. Eligible and compliant Full Applications per the FOA requirements will be evaluated against the technical review criteria as provided in the FOA.

Q3: Where are the successful commercial technologies that have come out an NNMI?

A3: The first DOE Clean Energy Manufacturing Innovation Institute, PowerAmerica, was only just officially launched in November 2014, and as such it is pre-mature to have any commercial successes at this time. DOE will publicize commercial successes from this and subsequent Clean Energy Manufacturing Innovation Institutes as they occur. Other NNMI Institutes are currently being led by the Department of Defense (DoD); questions about the DoD Institutes are referred to the DoD.

Q4: Can the test-beds use/apply current manufacturing technology in a different area?

A4: Each applicant determines what to submit. The purpose of the FOA is to seek applications from all interested and eligible entities to address the objectives and goals of the FOA; the specific technical topics of interest will be described in the FOA, as will application areas of particular emphasis, if any.

Q5: Are unfunded proposals subject to Freedom of Information Act (FOIA)?

A5: Unfunded proposals are subject to FOIA. Identifying information regarding applicants, including applicant names and/or points of contact, may be subject to public disclosure, whether or not such applicants are selected for negotiation of award. There are exceptions to FOIA requests including the

protection of trade secrets and commercial or financial information obtained from an entity that is privileged or confidential. A formal process exists for handling FOIA requests, including dialogue with the applicants before any information is released.

Q6: When will the Institute FOA be released?

A6: It is anticipated that the FOA will be released soon.

Q7: What dangers are there with upcoming Presidential elections that the 10-12 month development cycle gets cut by the new leadership?

A7: Interested parties are advised to review the FOA once released. The FOA will document the overall process, schedule, anticipated DOE funding and duration of efforts, evaluation and selection process, and proposer requirements.

Q8: Is cyber security a topic of interest of Smart Manufacturing Institute?

A8: As a government-wide priority, cyber-security and cyber-resiliency are important technical topics for cyber-physical systems. Each applicant determines what to submit. The purpose of the FOA is to seek applications from all interested and eligible entities to address the objectives and goals of the FOA; the specific technical topics of interest will be described in the FOA, as will application areas of particular emphasis, if any. DOE will not provide any recommendations prior to submission of an applicant Concept Paper.

Q9: Is the power generation industry considered in the topics under Smart Manufacturing?

A9: The power generation industry provides considerable energy inputs to the manufacturing sector, and electricity is a key component of manufacturing operations. Each applicant determines what to submit. The purpose of the FOA is to seek applications from all interested and eligible entities to address the objectives and goals of the FOA; the specific technical topics of interest will be described in the FOA, as will application areas of particular emphasis, if any. DOE will not provide any recommendations prior to submission of an applicant Concept Paper.

Q10: Understanding everything is subject to change, can you clarify the timeline you are anticipating: 45 days for submitting Concept Papers, and then again 45 days for the Full Application proposal. This seems short?

A10: Until the Smart Manufacturing FOA is released, earlier DOE Institute FOAs can serve as a reference regarding approximate expectations for the timeline. The final timeline for the Smart Manufacturing Institute Concept Paper and Full Application response will be provided in the FOA.

Q11: Will the Institute include the transportation sector?

A: The transportation equipment manufacturing sector is a significant component of the manufacturing sector. Each applicant determines what to submit. The purpose of the FOA is to seek applications from all interested and eligible entities to address the objectives and goals of the FOA; the specific technical topics of interest will be described in the FOA, as will application areas of particular emphasis, if any. DOE will not provide any recommendations prior to submission of an applicant Concept Paper.

Q12: How can I get a copy of your presentation?

A12: Presentations are posted on the DOE website at http://energy.gov/eere/amo/downloads/smart-manufacturing-institute-industry-day-workshop ; an email will be sent to registrants once the presentations are publically available.

Q13: Will electricity/energy management for a given processing plant be considered a relevant topic by and for a Smart Manufacturing Institute?

A13: Energy inputs, including electricity, and their management are a key component of manufacturing operations. Each applicant determines what to submit. The purpose of the FOA is to seek applications from all interested and eligible entities to address the objectives and goals of the FOA; the specific technical topics of interest will be described in the FOA, as will application areas of particular emphasis, if any. DOE will not provide any recommendations prior to submission of an applicant Concept Paper.

Questions posed by participants, but not submitted in written format:

Q14: On one of Director Johnson's slides, "Smart Manufacturing & Digital Manufacturing" Cyber Security was a key point of the "digital" program. Cyber security is important but how important is it to this program?

A14: Cyber security is an important topic for manufacturing operations. Each applicant determines what to submit. The purpose of the FOA is to seek applications from all interested and eligible entities to address the objectives and goals of the FOA; the specific technical topics of interest will be described in the FOA, as will application areas of particular emphasis, if any. DOE will not provide any recommendations prior to submission of an applicant Concept Paper.

Q15: Expand on your view of workforce development. We talk about technology in these meetings but what would DOE like to view across the states regarding workforce development?

A15: DOE Institutes include both technology development aspects and workforce and education aspects. Technical education and workforce development is one of the objectives for DOE Institutes. Until the Smart Manufacturing FOA is released, earlier DOE Institute FOAs can serve as a reference regarding approximate expectations for workforce development. For example, in the previous DOE Institute FOA focusing on polymer composites, quality of the technical education and workforce development plan was included as part of the evaluation criteria.

Q15 Follow-Up: Are you looking for innovation in this space (workforce development)?

A15 Follow-Up: Technical education and workforce development is an important topic for implementation of Smart Manufacturing technology. Each applicant determines what to submit. The purpose of the FOA is to seek applications from all interested and eligible entities to address the objectives and goals of the FOA. DOE will not provide any recommendations prior to submission of an applicant Concept Paper.

Q16: Do the governing guidelines in the FOA preclude the use of a dual hub-and-spoke leadership structure to guide the Institute? In that a dual hub would be used instead of one central Institute, i.e., there would be two or more leaders that supported the Institute.

A16: The FOA will provide guidance regarding the application process. A single entity will be required to be proposed as the prime recipient; the type of entities eligible to apply as the prime applicant will be included in the FOA. The prime recipient will enter into the award agreement with DOE. For example, in PowerAmerica, there is a central leadership function for the Institute at NC State, with numerous partners from across the country.

Q17: Will DOE National Labs be eligible to apply?

A17: Until the Smart Manufacturing FOA is released, earlier DOE Institute FOAs can serve as a reference regarding approximate expectations for DOE National Lab involvement. In the DOE Institute FOA focusing on polymer composites, DOE National Labs (specifically National Nuclear Security Administration Federally Funded Research and Development Centers - NNSA FFRDCs) were eligible to apply as the lead recipient, and both DOE/NNSA FFRDCs and non-DOE/NNSA FFRDCs were eligible to be sub-recipients on another entity's application, subject to the guidelines provided in the FOA. Final guidance for National Lab participation in the Smart Manufacturing Institute will be provided in the FOA when released.

Q18: Can a DOE National Laboratory be exclusive to one applicant when responding to a FOA?A18: Yes, a National Lab can be exclusive to one applicant. Labs are under no requirement to partner with all who ask.

3. EVENT PARTICIPANTS

Registration Process and Participants

Registration for the Smart Manufacturing Industry Day was opened to all interested stakeholders on February 12, 2015, via an online registration website. Notice of the event was posted on the AMO website on this date and a notice was emailed to thousands of AMO stakeholders. In addition, targeted registration announcements were prepared for specific stakeholders who had previously expressed interest in this technology topic at earlier DOE workshops, and were sent to approximately 250 individuals via personal emails and list-serve messages.

Altogether, there were a total of 121 registrants for the event. Only two individuals registered onsite; the remaining 119 were advanced registrants. Of the registrants:

- 43% (52) were from the private/industry sector,
- 41% (50) were from the academic sector, and
- 16% (19) were from the government sector.

The full list of meeting registrants is provided in the Appendix.

APPENDIX

Final Agenda

Georgia Tech Hotel and Conference Center 800 Spring Street NW Atlanta, GA 30308	
7:30 – 9:00 am	REGISTRATION AND CONTINENTAL BREAKFAST
9:00 – 9:05 am	Welcome **Mark Shuart**, DOE-AMO
9:05 – 9:30 am	Remarks from the DOE Advanced Manufacturing Office **Mark Johnson**, DOE-AMO
9:30 – 10:15 am	Smart Manufacturing Institute: Overview, Goals and Activities **Isaac Chan**, DOE-AMO
10:15 am – 10:45 pm	NETWORKING BREAK [Participants may submit Institute goals and activities questions during break]
10:45 – 11:30 am	Smart Manufacturing Institute: Contracting Overview and Requirements DOE-Golden Field Office
11:30 – 11:55 pm	Q&A: Institute Goals and Activities **DOE Panel response**
11:55 – 12:20 pm	Q&A: Institute Contracting Requirements **DOE Panel response**
12:20 – 12:30 pm	Concluding Remarks **Mark Shuart**, DOE-AMO
12:45 pm	MEETING FORMALLY ADJOURNS
1:00 am – 1:45 pm	LUNCH
1:45 – 4:00 pm	Plenary Room Available for Networking

The final agenda was compressed from the preliminary agenda to accommodate weather-related travel concerns.

The event was initially scheduled to be held at the Georgia Tech Global Learning Center. Due to the weather-related closure of the entire Georgia Institute of Technology campus, it was relocated to the privately-operated Georgia Tech Hotel and Conference Center.

Registrants

Name	Company
Masoumeh Aminzadeh	Georgia Institute of Technology
Julie Anderson	Department of Energy
Kate Anderson	National Renewable Energy Laboratory
Anita Balachandra	TechVision21
John Barker	SM&A
Dean Bartles	UI LABS
Suresh Baskaran	Pacific Northwest National Laboratory
B. Wayne Bequette	Rensselaer Polytechnic Institute
John Bernaden	Rockwell Automation
Mark Besser	Savigent
Gwendolyn Bluemich	GLOBALFOUNDRIES
Brad Bohlmann	University of Minnesota
Richard Braatz	Massachusetts Institute of Technology
Latanya Buckner	Georgia Tech Manufacturing Institute
Dan Callahan	DS Government Solutions
Bond Calloway	Savannah River National Laboratory
Kristen Catigan	Department of Energy
Isaac Chan	DOE Advanced Manufacturing Office
Leo Chiang	The Dow Chemical Company
Anne Clawson	Alcoa
Jonathan Cohen	Agency of Trillions
Trish Damkroger	Lawrence Livermore National Laboratory
Jim Davis	University of California, Los Angeles
Richard Donovan	University of California, Irvine
Craig Dory	Rensselaer Polytechnic Institute
Duane Dunlap	Purdue University
John Dyck	Rockwell Automation
Paul Evans	Southwest Research Institute
Robert Gao	Case Western Reserve University
Doreen Gonzalez-Gaboyan	Purdue University Center for Innovation through Visualization and Simulation
Maximilian Gorensek	Savannah River National Laboratory
Alison Gotkin	United Technologies Research Center
Robert Graybill	Nimbis Services Inc.
Hilena Hailu	The Association For Manufacturing Technology
Charles Hardin	Georgia Tech Research Institute
David Hardy	DOE Advanced Manufacturing Office
Gregory Harris	U.S. Army, Digital Manufacturing and Design Innovation Institute
Garry Harris	HTS Enterprise Energy Solutions
Jason Hattrick-Simpers	University of South Carolina
Robert Hitch	Enterprise Innovation Institute, Georgia Institute of Technology
Charles Hollis	Hollis Consulting
Mohammad Hossain	Georgia Institute of Technology
Ninja Huang	General Motors

Name	Company
Pam Hurt	SME
Michael Hutto	University of South Carolina
Keith Jamison	Energetics Incorporated
Barbara Jeol	Georgia Tech Manufacturing Institute
Mark Johnson	DOE Advanced Manufacturing Office
Mak Joshi	Schneider Electric
Kathleen Kosciolek	Rochester Institute of Technology
Abigail Kuchan	Lockheed Martin
Jackie Kulfan	PPG Industries, Inc.
Tom Kurfess	Georgia Institute of Technology
Reza Langari	Texas A&M University
Frank Ledbetter	Auburn University
G.P. Li	University of California, Irvine
Stephanie Locks	Georgia Institute of Technology
Yan Lu	National Institute of Standards and Technology
Jim Mac Dougall	Air Products
Haresh Malkani	Alcoa Technical Center
Norman Marsolan	Georgia Institute of Technology
Charlie McBride	Louisiana Center for Manufacturing Sciences
Don McConnell	Georgia Institute of Technology
Gary McCullen	O'Brien & Gere
Leon McGinnis	Georgia Institute of Technology
Timothy McJunkin	Idaho National Laboratory
Laine Mears	Clemson University
Larry Megan	Praxair
Shreyes Melkote	Georgia Institute of Technology
Ron Melton	Pacific Northwest National Laboratory
Qadir Mohtasham	PAP Co.
Nabil Nasr	Rochester Institute of Technology
Chandra Nath	Georgia Institute of Technology
Richard Neal	Louisiana Center for Manufacturing Sciences
Erica Nemser	Compact Membrane Systems
Stephen Nunez	DOE Advanced Manufacturing Office
Ruel Overfelt	Auburn University
Todd Packer	Kent Displays, Inc.
Michelle Pastel	Corning, Inc. / Smart Manufacturing Leadership Coalition
Alan Perlstein	Mid-West Energy Research Consortium
Stratos Pistikopoulos	Texas A&M Energy Institute
Yarom Polsky	Oak Ridge National Laboratory
Vittal Prabhu	Penn State University
Amara Projansky	Agency of Trillions
Melur Ramasubramanian	Clemson University
Douglas Ramsey	Alcoa Inc.
Ali Razban	IUPUI (Indiana University-Purdue University Indianapolis)
Craig Rieger	Idaho National Laboratory
Mike Rinker	Pacific Northwest National Laboratory
Jeff Roberts	Lawrence Livermore National Laboratory

Name	Company
Jeffrey Rogers	O'Brien & Gere
Carmel Ruffolo	University of Wisconsin-Milwaukee
Christopher Saldana	Georgia Institute of Technology
Steven Schmid	Notre Dame
Dean Schneider	Texas A&M Engineering Experiment Station
Tim Scott	Novati Technologies Inc.
Leyuan Shi	University of Wisconsin-Madison
Jianjun Shi	Georgia Institute of Technology
Mark Shuart	DOE Advanced Manufacturing Office
Phillip Smith	ITECS Innovative
Sanjeev Srivastava	Siemens Corporation
Ken Stewart	Georgia Institute of Technology
Denise Swink	Smart Manufacturing Leadership Coalition
Rebecca Taylor	National Center for Manufacturing Sciences
Amul Tevar	Ohio State University-Battelle
Catherine Thibaud-Erkey	United Technologies Research Center
Tommy Tucker	Tucker Innovations Inc.
David Turpin	Agenda 2020
Eric Vogel	Georgia Institute of Technology
Yan Wang	Georgia Institute of Technology
Andre Wegner	Authentise Inc.
Andrea Wesser	International Consortium for Advanced Manufacturing Research
George White	Georgia Institute of Technology
David Williams	Louisiana Center for Manufacturing Sciences
Zhengkai Wu	Georgia Institute of Technology
Erik Ydstie	Carnegie Mellon University
Mike Yost	MESA International
Xiaowei Yue	Georgia Institute of Technology
Nikolaus Zant	ABB Corporate Research
Ben Zoghi	Texas A&M University

Acronym List

AMO	Advanced Manufacturing Office
ARPA-E	Advanced Research Program Agency-Energy
CEMI	Clean Energy Manufacturing Initiative
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
EERE	Office of Energy Efficiency and Renewable Energy
FOA	Funding Opportunity Announcement
FOIA	Freedom of Information Act
FFRDC	Federally Funded Research and Development Center
IP	intellectual property
IT	information technology
MRL	Manufacturing Readiness Level
NIST	National Institute of Standards and Technology
NNMI	National Network for Manufacturing Innovation
NNSA	National Nuclear Security Administration
NOI	Notice of Intent
R&D	research and development
RD&D	research, development and demonstration
RFI	Request for Information
TRL	Technology Readiness Level

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