

Regulatory Perspectives on Advanced Manufacturing Technology

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Key Messages

- Efficient and effective disposition of advanced manufacturing technology (AMT) proposals
- Current regulatory framework is sufficient for AMTs
- Reasonable assurance of adequate protection based on performance criteria and safety significance
- Early communication/coordination with stakeholders

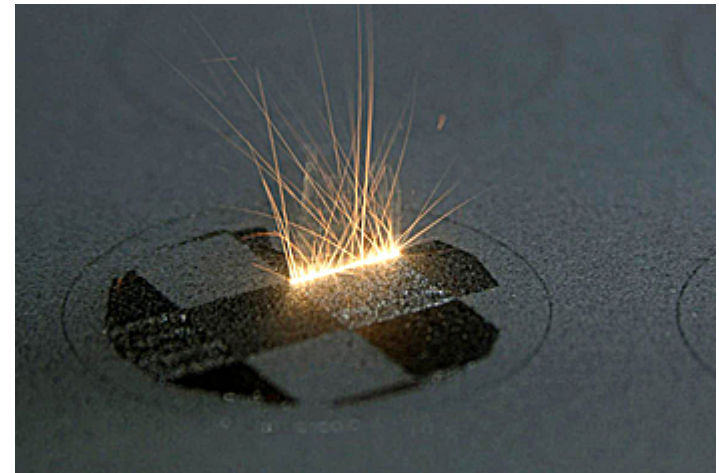
Advanced Manufacturing Technologies

Techniques and material processing methods that have **not** been:

- Traditionally used in the U.S. nuclear industry
- Formally standardized/codified by the nuclear industry

Examples:

- Additive manufacturing
- Powder metallurgy, hot isostatic processing (PM-HIP)
- Electron beam welding
- Coating/cladding methods

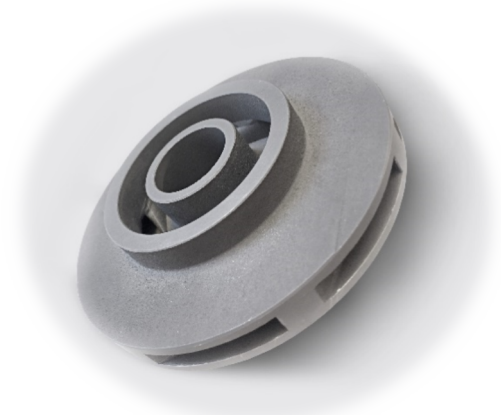


Credit: Beamie Young\NIST

Anticipated Deployment

AMTs are becoming increasingly applicable to the U.S. nuclear industry and the U.S. Nuclear Regulatory Commission (NRC) mission:

- Foreign nuclear plants
- Aerospace, U.S. Department of Defense, and industries with high-reliability needs
- Significant resources expended and demonstration parts fabricated



108mm diameter impeller
Krško NPP, Slovenia
Credit: Siemens

Technology development and possible implementation are moving rapidly, and the agency seeks to proactively position itself to respond appropriately

Transformation and AMTs

NRC Transformation Initiative

- Realize marked enhancements in NRC effectiveness, efficiency, and agility
- **New materials and manufacturing approaches**
- Actively identify, encourage, and implement innovation and transformation to advance the NRC mission
- Emphasis on proactive posture for new technologies



AMT Regulatory Paths

Nonregulated
Application

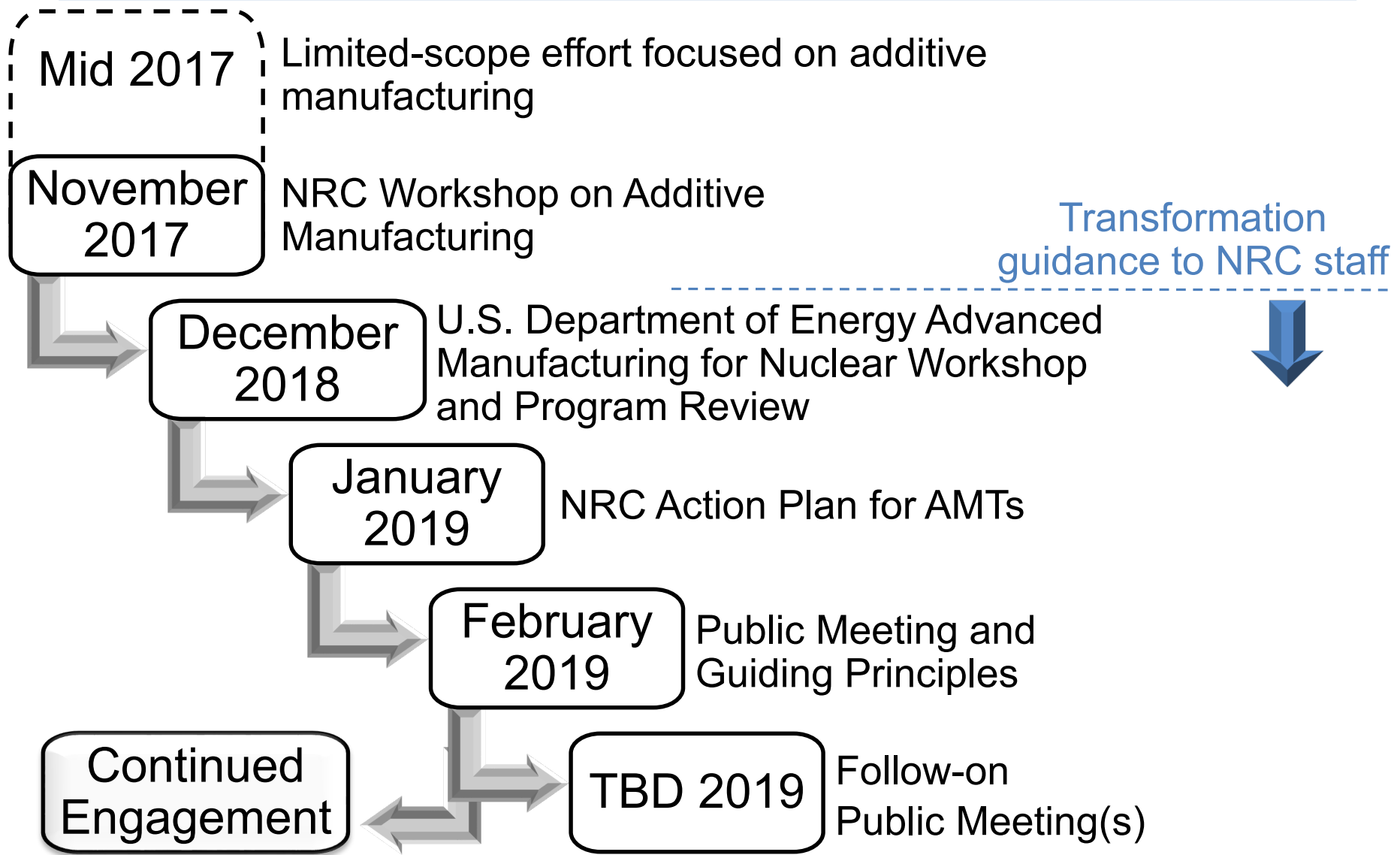
10 CFR 50.59
Changes, Tests and
Experiments.



10 CFR 50.55a
Codes and
Standards (C&S)

10 CFR 50.55a(z)
Alternatives to C&S
Requirements

Proactive Posture



Lessons Learned

Efficient reviews:

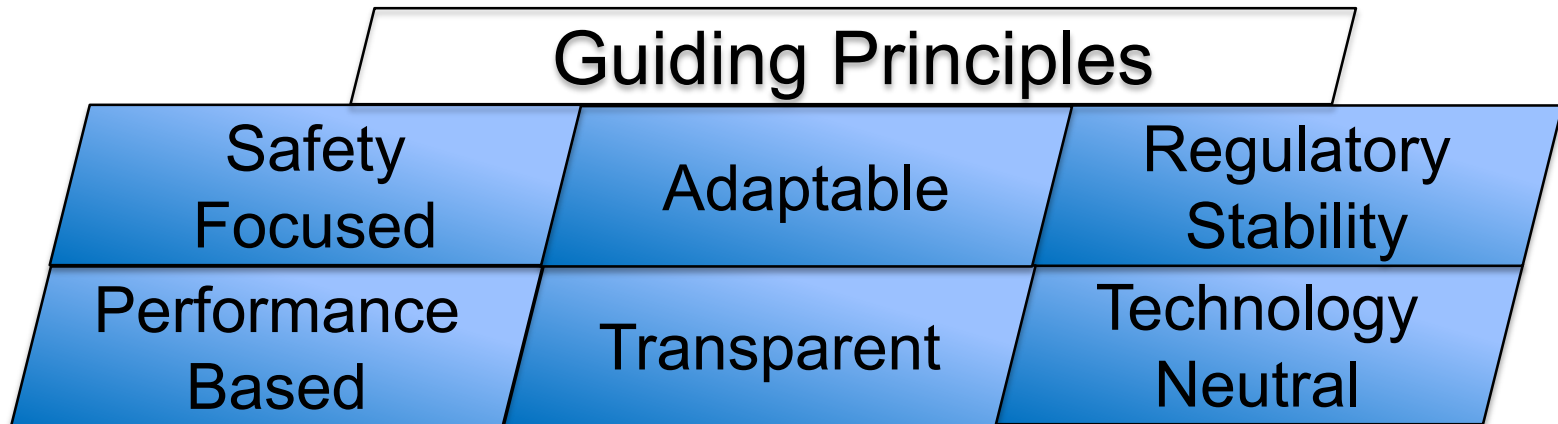
- **Early** communication and precoordination
- Quality and completeness of applications/submittals
- Staff knowledge of topic **prior** to submittal:
 - General technical aspects
 - Technology meets (or fails to meet) the consensus C&S and/or regulations
 - Past research and ability to conduct appropriate confirmatory research

Emphasis on activities that occur
prior to a formal submittal/request

AMT Working Group

Purpose:

- Initiate a strategy—AMT Action Plan
- Proactively position for an efficient, effective, and transparent regulatory evaluation of expected licensee use of AMT



AMT Action Plan

Five major tasks outlined over the next 12 months

Task 1: Near-Term (~6 months)

Task 3: NRC Guidance

Task 4: Knowledge Management

Task 2: Continuing Activities

Task 5: Periodically Update
Action Plan

Future Public Meetings

Planned:

- September 2019—Generic technical information needed in AMT submittals

Potential:

- October 2019—Clarification, modification, and development of guidance documents
- TBD—NRC workshop / status meeting

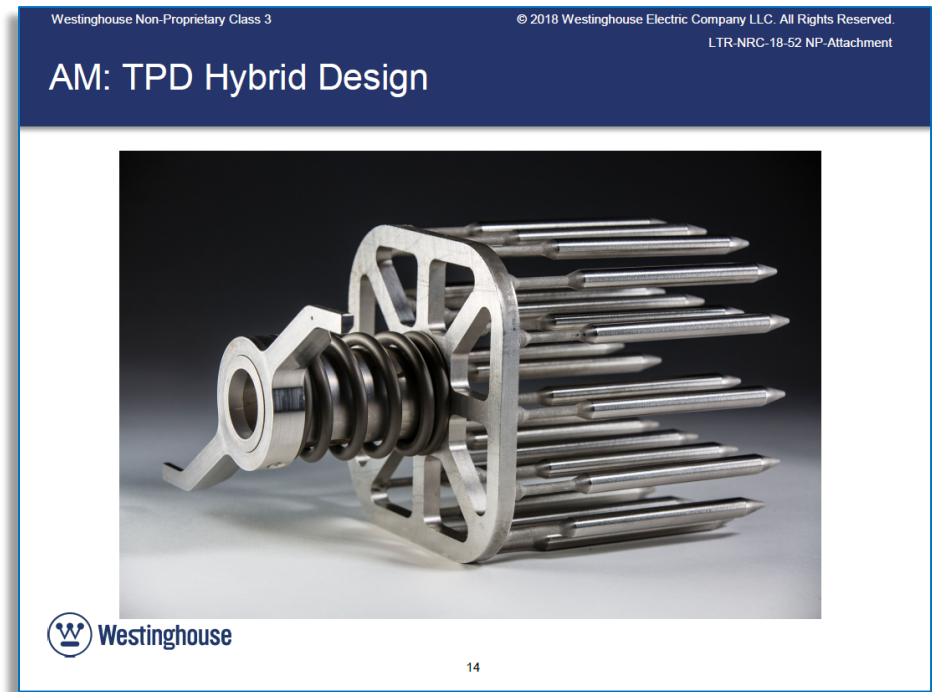
For Implementation of AMT:

- At stakeholders' request
- Future and/or “candidate” applications

Candidate Application

Thimble Plugging Device:

- Additive manufacturing
- SS 316L (wrought 304 SS)
- Non-American Society of Mechanical Engineers Boiler and Pressure Vessel Code class
- Reactor water environment
- Title 10 of the Code of Federal Regulations (10 CFR) 50.59
- Estimate ~6 months



Path Forward

- Maintain alignment with the NRC Transformation Initiative
- Execute and maintain the Action Plan
- Adhere to the agency's Guiding Principles
- Continue communication and transparency with stakeholders



Thank You



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