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Technology Risk Mitigation Research and Development for the Matter-Radiation Interactions in Extremes (MaRIE) Project CRIS W. BARNES, JUAN FERNÁNDEZ, THOMAS HARTSFIELD, RICHARD SANDBERG, RICHARD SHEFFIELD, JOHN P. TAPIA, ZHEHUI WANG, Los Alamos National Laboratory — NNSA does not have a capability to understand and test the response of materials and conditions necessary to determine the linkages between microstructure of materials and performance in extreme weapons-relevant environments. Required is an x-ray source, coherent to optimize imaging capability, brilliant and high repetition-rate to address all relevant time scales, and with high enough energy to see into and through the amount of material in the middle or mesoscale where microstructure determines materials response. The Department of Energy has determined there is a mission need for a MaRIE Project to deliver this capability. There are risks to the Project to successfully deliver all the technology needed to provide the capability for the mission need and to use those photons to control the time-dependent production and performance of materials. The present technology risk mitigation activities for the MaRIE project are: developing ultrafast high-energy x-ray detectors, combining the data from several imaging probes to obtain multi-dimensional information about the sample, and developing techniques for bulk dynamic measurements of temperature. This talk will describe these efforts and other critical technology elements requiring future investment by the project.

Cris W. Barnes
Los Alamos National Laboratory

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