NNSA approves ‘Critical Decision 1’ for Advanced Sources and Detectors Project, a new tool to advance stockpile stewardship

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The project is designed to generate x-ray images of subcritical experiments for the Nation’s nuclear weapons program

LOS ALAMOS, N.M., Feb. 14, 2019—The National Nuclear Security Administration (NNSA) has approved Critical Decision-1 (CD-1) for the Advanced Sources and Detectors Project (ASD), a cornerstone of the Enhanced Capabilities for Subcritical Experiments portfolio (ECSE). ASD is a proposed 20-million electron volt (MeV) accelerator that will generate X-ray images, or radiographs, of subcritical implosion experiments for the nuclear weapons program.

“The ECSE portfolio is designed to better understand plutonium when it is subjected to extreme pressure from explosively driven shocks, a central mission need for NNSA’s science-based Stockpile Stewardship Program,” said Thom Mason, Director of Los Alamos National Laboratory (LANL). “The ECSE program continues the outstanding stockpile science of the past 30 years, assuring the safety, security and effectiveness of the U.S. nuclear deterrent without the need for full-scale underground nuclear testing."

The NNSA's national laboratories are working together to pursue ECSE. Los Alamos is leading this federally-directed plan with Sandia National Laboratories, the Nevada National Security Site (NNSS) and Lawrence Livermore National Laboratory to develop new diagnostic capabilities so that scientists can study plutonium in much more detail under the conditions found inside the final stages of a nuclear weapon implosion — but without the nuclear yield — called a "subcritical experiment."

“The new diagnostics capabilities provided by ASD will significantly enhance and expand the ability to measure the dynamic behavior of plutonium under weapons-relevant conditions,” said Bob Webster, Deputy Director of Los Alamos National Laboratory for Weapons.

The ASD project today achieved CD-1 from NNSA. CD-1 is the second of four steps to begin building the ECSE accelerator. CD-0 was approval of mission need. CD-1 establishes the preferred alternative design and estimated budget. This phase allows

the Laboratory to move forward with the ASD preliminary design. CD-2 establishes the performance baseline for the accelerator (cost and schedule based on preliminary design). Finally, CD-3 approves procurement, fabrication, assembly, and installation.

ECSE is one of the initiatives the nation is pursuing to ensure the necessary capability, capacity and responsiveness of the nuclear weapons infrastructure and the needed skills of the nuclear enterprise workforce, as called for in the 2018 Nuclear Posture Review.

The U1a underground laboratory, located at the NNSS, will be substantially modified (under the U1a Complex Enhancements Project, or UCEP, another element of ECSE) to make way for ECSE's ASD and a measurement apparatus called Neutron Diagnosed Subcritical Experiments (NDSE), a new approach to making measurements that haven't been acquired since the cessation of underground testing

"The ASD radiographic capability will be used to examine the late-time behavior of plutonium in high-explosive driven experiments," said Dave Funk, Project Director for the ASD Project at Los Alamos National Laboratory.

Los Alamos will be heavily involved in this NNSA Complex-wide endeavor. According to current plans, Los Alamos will develop the accelerator, detector and global systems for ASD— plus develop the NDSE diagnostic tool — while overseeing the integration of all elements as the project moves forward.

"The goal is to be able to make NDSE and ASD radiographic measurements simultaneously, using data from both diagnostics to further enhance our understanding of plutonium hydrodynamics and to improve our simulation capabilities," Funk said.

ASD, which will be housed in the underground U1a facility at the NNSS, is projected to be available for subcritical experiment execution in the 2025 time-frame.