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U.S. Nuclear Weapons Modernization – the Stockpile Life Extension Program

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Underground nuclear testing of U.S. nuclear weapons was halted by President George H.W. Bush in 1992 when he announced a moratorium. In 1993, the moratorium was extended by President Bill Clinton and, in 1995, a program of Stockpile Stewardship was put in its place. In 1996, President Clinton signed the Comprehensive Nuclear Test Ban Treaty (CTBT). Twenty years have passed since then. Over the same time, the average age of a nuclear weapon in the stockpile has increased from 6 years (1992) to nearly 29 years (2015). At its inception, achievement of the objectives of the Stockpile Stewardship Program (SSP) appeared possible but very difficult. The cost to design and construct several large facilities for precision experimentation in hydrodynamics and high energy density physics was large. The practical steps needed to move from computational platforms of less than 100 Mflops/sec to 10 Teraflops/sec and beyond were unknown. Today, most of the required facilities for SSP are in place and computational speed has been increased by more than six orders of magnitude. These, and the physicists and engineers in the complex of labs and plants within the National Nuclear Security Administration (NNSA) who put them in place, have been the basis for underpinning an annual decision, made by the weapons lab directors for each of the past 20 years, that resort to underground nuclear testing is not needed for maintaining confidence in the safety and reliability of the U.S stockpile. A key part of that decision has been annual assessment of the physical changes in stockpiled weapons. These weapons, quite simply, are systems that invariably and unstoppably age in the internal weapon environment of radioactive materials and complex interfaces of highly dissimilar organic and inorganic materials. Without an ongoing program to rebuild some components and replace other components to increase safety or security, i.e., life extending these weapons, either underground testing would again be required to assess many changes at once, or confidence in these weapons would be reduced. The strategy and details of the U.S. Stockpile Life Extension Program will be described in this talk. In brief, the strategy is to reduce the number of weapons in the stockpile while increasing confidence in the weapons that remain and, where possible, increase their safety, increase their security, and reduce their nuclear material quantities and yields. A number of “myths” pertaining to nuclear weapons, the SSP, and the Stockpile Life Extension Program will be explored.