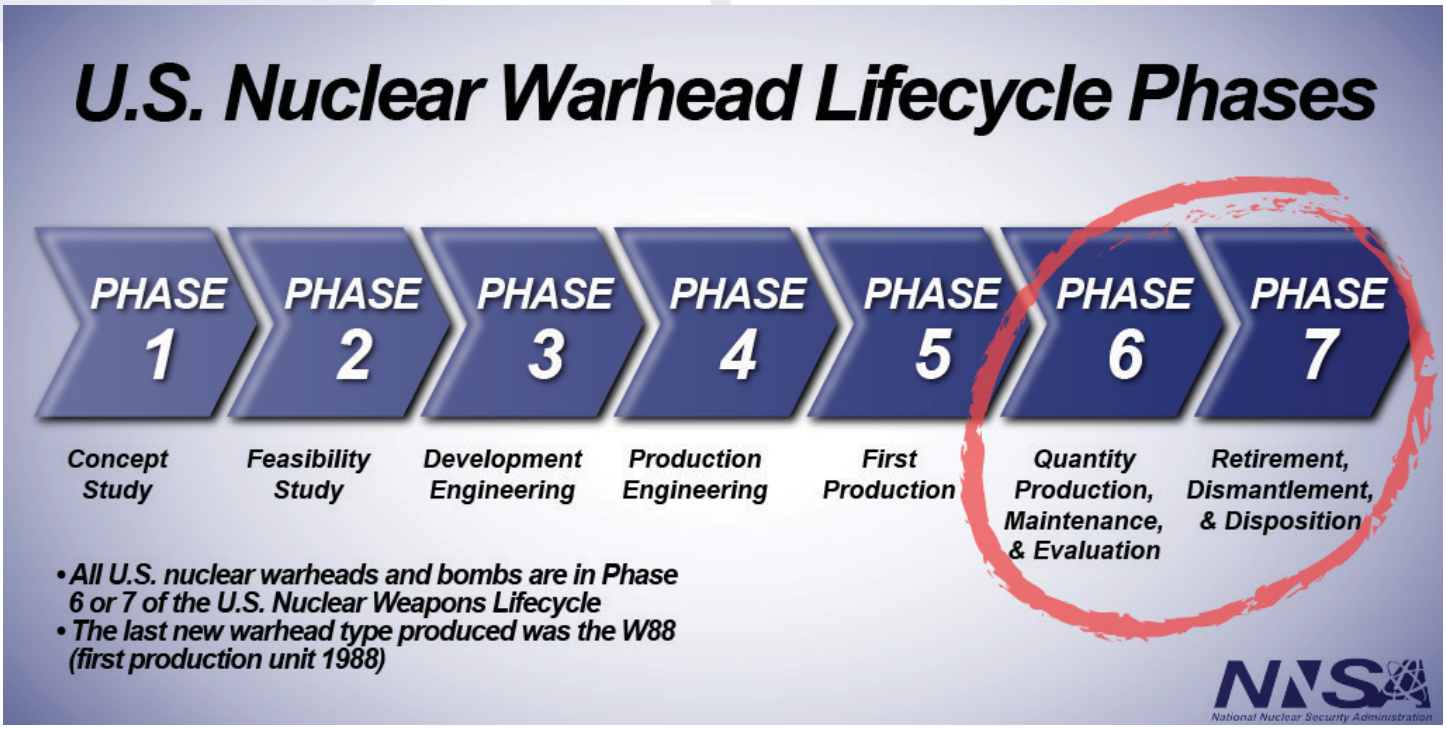
Nuclear Weapons Life Cycle

Nuclear weapons are conceptually-designed, developed, produced, and maintained in the stockpile, and then retired and dismantled. This sequence of events is known as the nuclear weapons life cycle. The Department of Energy (DOE) through the National Nuclear Security Administration (NNSA) and in partnership with Department of Defense (DOD) through the Nuclear Weapons Council, conducts activities in a joint nuclear weapons life cycle process for sustainment of the stockpile through refurbishment activities. The major steps, or phases, of the life cycle are described below. Currently, the United States only utilizes phases 6 and 7 of this process, as no new nuclear weapons designs have been introduced since 1991.



Phase 1 – Concept Study

DOE/NNSA and/or DOD make preliminary assessments of the effectiveness and survivability of a weapon concept and identify delivery system/nuclear warhead trade-offs.

Phase 2 – Program Feasibility Study

The technical feasibility of weapon concepts developed in Phase 1 is determined. Alternatives within the concepts are also developed.

Phase 2A – Design Definition and Cost Study

Once the feasibility study is completed, the Phase 2A study is conducted to refine warhead design definition, program schedule, and cost estimates.

Nuclear Weapons Life Cycle

Phase 3 – Full-Scale Engineering Development

The program baseline is established in Phase 3, and additional efforts to test and evaluate the warhead to engineering standards are completed.

Phase 4 – Production Engineering

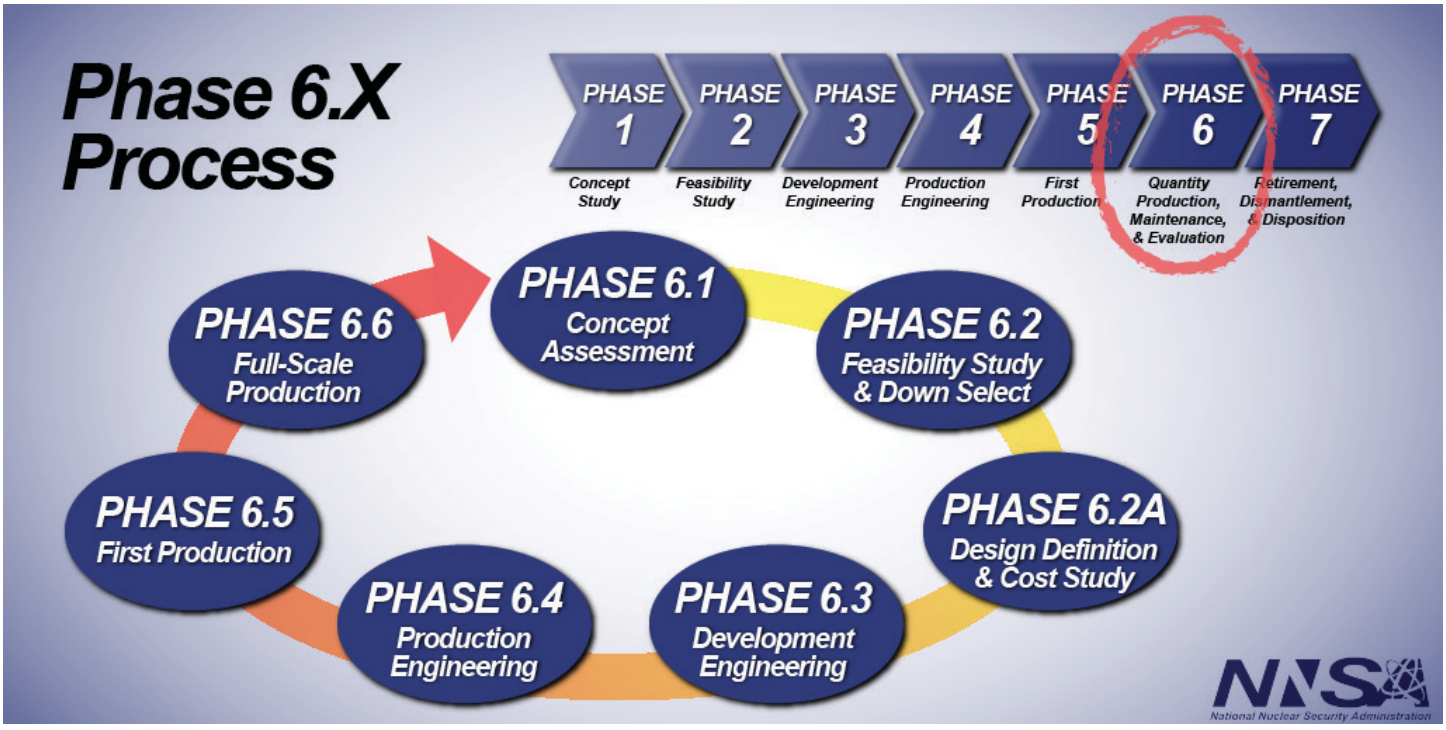
DOE/NNSA transitions the developmental warhead design into manufacturing processes. The required production line equipment and tools are designed to ensure that all required components can be produced.

Phase 5 – First Production

DOE/NNSA procures raw materials, establishes the production line, starts producing components, evaluates the production processes and products, and makes modifications if necessary. DOE/NNSA conducts tests and evaluations of the warhead components from the production line.

Phase 6 – Quantity Production and Stockpile Maintenance and Evaluation

DOE/NNSA increases the production rate of warheads and components and delivers the completed warheads to DOD for the stockpile. NNSA continues to test and evaluate components as required. Stockpile maintenance is performed. Safety, security, personnel reliability, use control, transportation, supply publications, accountability, inspections, emergency response preparation and exercises, and technical operations training are performed.



The National Nuclear Security Administration is a semi-autonomous agency within the U.S. Department of Energy responsible for enhancing national security through the military application of nuclear science. NNSA maintains and enhances the safety, security, and effectiveness of the U.S. nuclear weapons stockpile without nuclear explosive testing; works to reduce the global danger from weapons of mass destruction; provides the U.S. Navy with safe and effective nuclear propulsion; and responds to nuclear and radiological emergencies in the U.S. and abroad.

National Nuclear Security Administration

Nuclear Weapons Life Cycle

Phase 6.1 – Concept Assessment
Concepts to meet DOD and DOE/NNSA needs are assessed. If valid, the Project Officers Groups (POG) decides whether a formal program study is warranted or whether the activity should be managed as a maintenance action outside the 6.X Process.

Phase 6.2 – Feasibility Study and Design Options
During Phase 6.2, the POG develops design options and assesses the feasibility (e.g., cost, schedule, and technical maturity) of these options based on developed criteria to include tradeoffs and courses of action depending on military characteristics, stockpile-to-target sequences, timelines, and budgetary and resource constraints to meet the needs for a particular nuclear weapon.

Phase 6.2A – Design Definition and Cost Study
The POG refines the down-select options by updating criteria, developing design and qualification plans, identifying production needs, and creating a preliminary life-cycle plan. This phase culminates with the release of the Joint Integrated Project Plan (JIPP) from the POG and the Weapon Design and Cost Report (WDCR) from the DOE/NNSA. The JIPP serves as the baseline control document for the stockpile sustainment activity.

Phase 6.3 – Development Engineering
DOE/NNSA in coordination with the DOD conducts experiments, tests, and analyses to develop and validate the selected design option. The national laboratories initiate process development activities and produce test hardware, as required.

Phase 6.4 – Production Engineering
DOE/NNSA refines the developmental design into a producible design and prepares the production agencies for production. DOE/NNSA updates production cost estimates and defines procedures with the DOD to conduct stockpile sustainment.

Phase 6.5 – First Production
DOE/NNSA production agencies produce the first warheads. The POG determines if these warheads meet design and military requirements.

Phase 6.6 – Full-Scale Production
DOE/NNSA must have written authorization from the NWC prior to beginning full-scale production and delivery of refurbished weapons for the stockpile.

Phase 7 – Retirement/Storage
Retirement is the reduction quantity of that warhead-type in the stockpile. This phase initiates a process that continues until all warheads of that type are retired and dismantled. This phase is also organized into three sub-phases: Phase 7A - Weapon Retirement, Phase 7B - Weapon Dismantlement, and Phase 7C - Component and Material Disposal.

Source: Procedural Guideline for the 6.X Process, September 2015