



*President Dwight D. Eisenhower makes his "Atoms for Peace" speech to the General Assembly of the United Nations on December 8, 1953.*

# Plowshare Program

## Bombs for Peace

Initial plans for Project Plowshare were approved by the Atomic Energy Commission in 1957. By the end of 1958, Dr. Edward Teller, the director of Livermore Laboratory - the lead for the project, outlined an ambitious Plowshare Program that included: construction of a channel through a reef at Kapingamarangi, Marshall Islands; harbors at Cape Thompson and Katalla, Alaska; a canal across the Alaskan peninsula at Port Moller; oil extraction from tar sands and oil shale; creating artificial aquifers; and mining by leaching. However, before it even began, the program was halted by the international moratorium on nuclear weapons testing in 1958. No nuclear tests were conducted for almost three years. During that time, Plowshare planning studies and high explosive tests would be conducted to evaluate excavation techniques.

## Moratorium Ends - Testing Begins

When the moratorium ended on September 1, 1961, the United States resumed testing on September 15. The Gnome study, in December 1961, was the first Plowshare test. Project Gnome was intended to provide a detailed understanding of the underground environment created when a nuclear explosion was detonated in thick



*The Plowshare Program embodied President Eisenhower's Atoms for Peace initiative, revised in 1953.*

salt deposits located in New Mexico. Gnome also studied the feasibility of extracting trapped heat generated by a nuclear detonation for conversion into steam to produce electric power.

As the program progressed, Plowshare scientists conducted a 104-kiloton cratering experiment named Sedan in July 1962, to study techniques for nuclear excavation. Sedan, and others like it, studied cratering effects from explosions in the 100-kiloton range at the Nevada National Security Site, formerly known as the Nevada Test Site. Three subsequent nuclear cratering experiments - Cabriole, Buggy, and Schooner - provided data on the creation of craters formed in hard rock.

## Introduction

On June 6, 1958, the United States Atomic Energy Commission, now the U.S. Department of Energy (DOE), announced the Plowshare Program, named for the biblical injunction to ensure peace by "beating swords into plowshares."

The program was designed as a research and development activity to explore the technical and economic feasibility of using nuclear explosives for industrial applications. President Dwight D. Eisenhower introduced the concept in his "Atoms for Peace" speech before the United Nations on December 8, 1953. Eisenhower attempted to transform the atom from a perceived tool of destruction into a benefit for mankind. The relatively inexpensive energy available from nuclear explosions could prove useful for a wide variety of peaceful purposes, such as: canals, harbors, highway and railroad cuts through mountains, open pit mining, dam construction, and other quarry and construction related projects. Underground nuclear explosions included stimulation of natural gas production, and formation of underground natural gas and petroleum storage reservoirs.

## Natural Gas Stimulation

Over the twelve-year lifespan of the Plowshare Program, the United States conducted several gas stimulation tests: Gasbuggy, a 29-kiloton device, detonated in 1967, in Farmington, New Mexico; and Rulison, a 40-kiloton device detonated in 1969 in Grand Valley, Colorado. These nuclear experiments studied the feasibility of using a nuclear device to increase natural gas production in tight, gas-producing geologic formations. (There were no radioactive releases because all of the radionuclides were contained within the geologic formation.)

In May 1973, Rio Blanco, a three (33-kiloton each) nuclear explosive test as part of a joint government-industry natural gas stimulation experiment near Rifle, Colorado. Three 33-kiloton devices were simultaneously detonated to test the economic feasibility of stimulating the flow of natural gas by fracturing rock formations with underground nuclear detonations.

## Plowshare Termination

Plowshare was a program that started with great expectations and high hopes, but ended due to insufficient public or Congressional support.

In the end, the most promising use for nuclear explosions proved to be the



*Sedan crater is a result of a Plowshare Program test to study excavation techniques using nuclear weapons.*

stimulation of natural gas production. However, although the technology was demonstrated to be technically feasible, national energy needs did not justify the elaborate procedures required to obtain the natural gas. This fact, combined with environmental concerns and the lack of public support for the program, made it unlikely that Congress would ever pursue this commercial joint government-industry venture.

By 1974 approximately \$82 million had been invested in the nuclear gas stimulation program. It was estimated that after 25 years of gas production of all the natural gas deemed recoverable, only 15 to 40 percent of the investment could be recovered. Consequently, under the pressure of economic and environmental concerns, the Plowshare Program was discontinued at the end of Fiscal Year 1975.



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