SOME RESULTS OF GASBUGGY

One of the experiments in the peaceful uses of nuclear explosives which has provided useful information for the Agency's investigations into possible applications was carried out in USA in December 1967. Some of the results so far known are given below.

The object of the experiment, which had the code name GASBUGGY, was to investigate the feasibility of the method to stimulate a low-producing gas field. It was carried out at a depth of 4240 feet and a nuclear explosive with a yield of 26 kilotons – equivalent in force to 26 000 tons of high explosive – was used. The site was the San Juan Basin in New Mexico and the rock formation was gas-bearing shale.

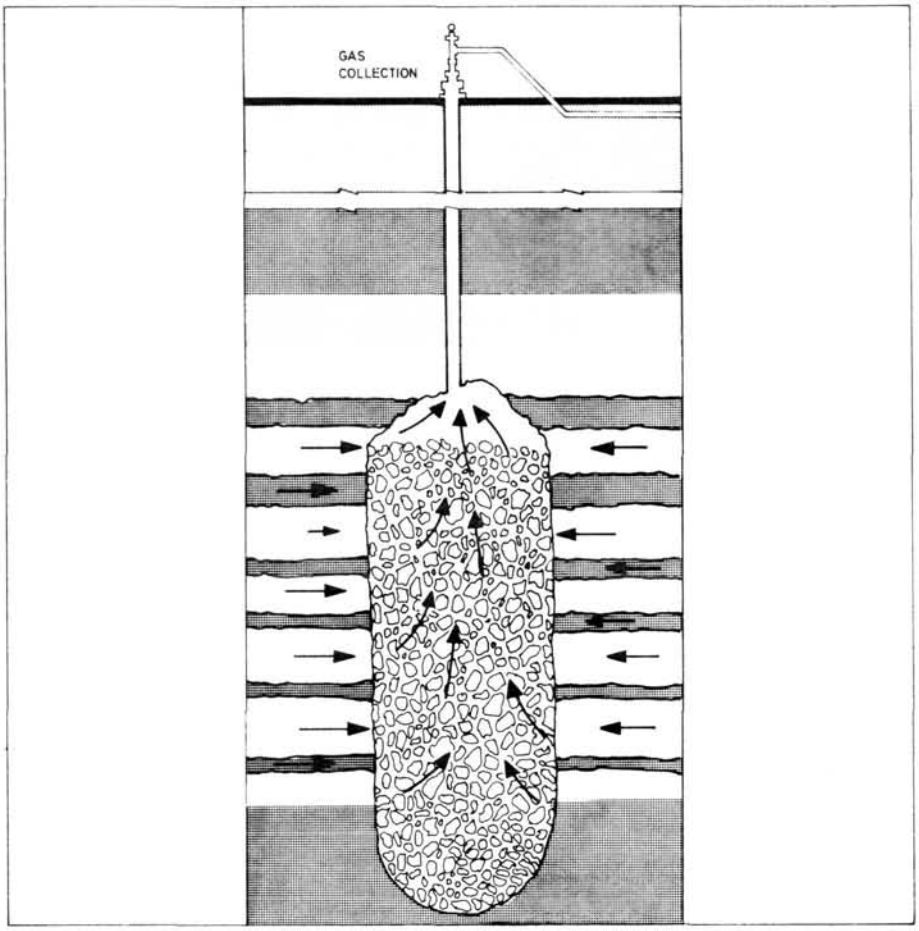
Preliminary results indicate that in accordance with expectations material collapsing into the cavity which was formed created a chimney of broken and crushed rock approximately 330 feet high with a volume of at least two million cubic feet.

A series of three production tests, each lasting 30 days, was completed during the first half of 1969. They were intended to measure the rate of influx of gas from the surrounding rock formation. Gas was withdrawn at rates necessary to maintain pre-selected pressures in the area of the explosion and a different pressure was chosen for each test period.

During the tests the total amount of gas produced was about 109 million cubic feet. Total production since the emplacement hole was re-entered was 167 million cubic feet. A little more than 400 feet away there is a well created conventionally and using the same rock formation. Production from this well over nine years was 85 million cubic feet. Preparations have been made for a production test from the nuclear cavity lasting six months.

Other tests showed that the hydrocarbon content of the gas from the nuclear cavity rose about one third and the carbon-dioxide decreased by half. Analysis to determine composition and distribution of radioactivity indicates that the concentration of tritium in the gas itself is less than predicted.

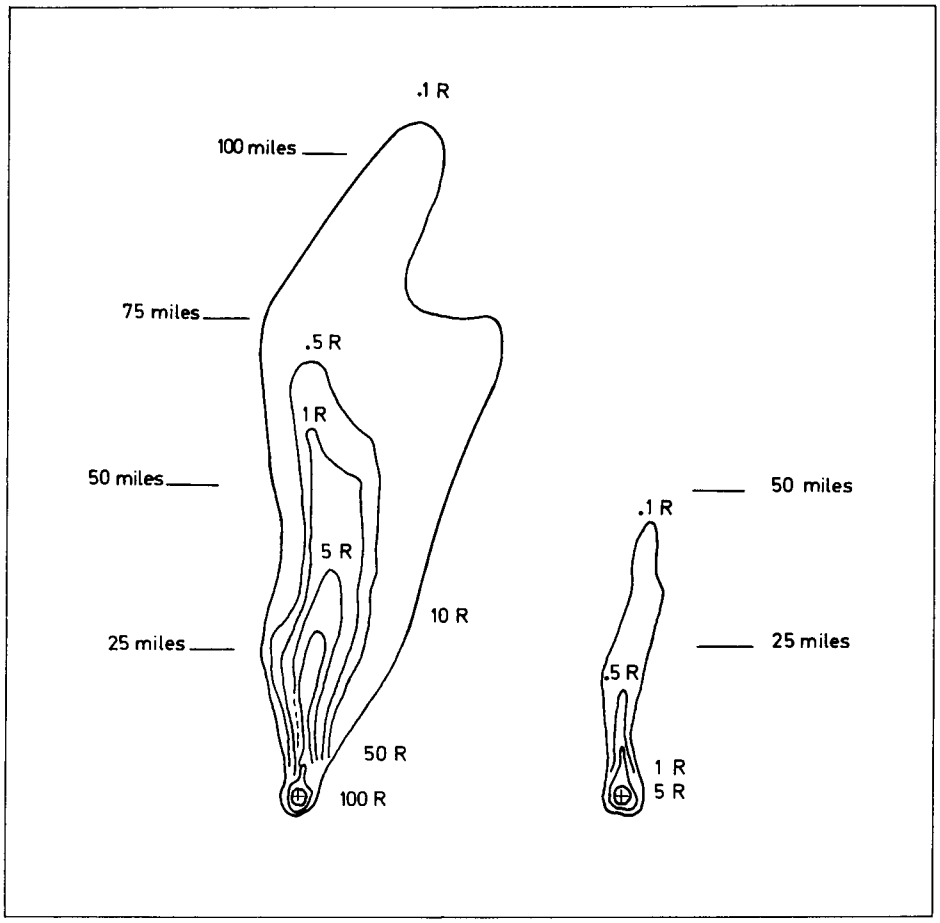
The results support present ideas that contained explosions may be considered as a possibility for the recovery of natural resources. The US Bureau of Mines has estimated that nuclear stimulation, if proved feasible, could more than double present natural gas reserves from fields located in the Rocky Mountain area alone. Another estimate, related to oil shale, is that 400 billion barrels of oil are potentially recoverable from a formation in Colorado and that nuclear explosives might be a way of reaching a source at present untappable. Other thoughts extend to recovery of minerals such as copper from low-grade deposits.



Schematic drawing of the chimney caused by an underground nuclear explosion designed to study gas release. It contains rubble, leaving an empty space at the top. The shaded areas indicate gas-bearing sandstone and the flow of gas is shown by arrows.

Again it must be emphasized that more research and development is needed to develop precise understanding of the effects and how they vary with the amounts of explosive, depths and types of rock. The techniques of placing explosives and possible modifications also require considerable investigation.

Among the tests so far carried out have been a number connected with the possibility of forming craters or ditches for such purposes as creating canals. The amount of radioactivity released to the atmosphere is one of the questions being studied. The diagram given here gives an indication of advances made in reducing such radioactivity as a result of improved explosive designs and the use of special emplacement techniques. The pattern on the left is similar to that created in a 100 kiloton nuclear cratering experi-



Progress in reducing radioactivity released to the atmosphere is shown by these diagrams. The pattern on the left is similar to the 1962 Project Sedan 100-kiloton (100 000 tons TNT) experiment at the Nevada Test Site, USA. The pattern on the right shows what the pattern would be with present technology. R stands for roentgens.

ment in alluvium conducted in July 1962. It shows the amount of radioactivity as a dose measured in roentgens at distances up to just over 100 miles from the site. The pattern on the right shows what the effects would have been from the same type of test using 1968 technology. The roentgen is an international unit related to X-rays and gamma rays. It is used to measure radiological doses to human beings. In terms of energy it would take more than one million roentgens to warm a gram of air by 1°Centigrade.

A report "Status of Plowshare Technology", prepared by the U.S. Atomic Energy Commission, has been made available by the U.S. Government to Member States of the Agency. It includes information on Project Gasbuggy from which the above was prepared.