

EL PASO NATURAL GAS COMPANY
El Paso, Texas

May 19, 1969

PROJECT WAGON WHEEL

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FACT SHEET

A study relating to a possible experiment in the use of a nuclear explosive deep underground in western Wyoming

INTRODUCTION

El Paso Natural Gas Company, a diversified natural gas transmission company, is conducting a study relating to a possible experiment in the use of a nuclear explosive deep underground in western Wyoming. The study, which has been in progress since early this year and is expected to take another 15 months or more, will evaluate the Pinedale Unit natural gas field near Pinedale as a potential site for such an experiment. The object of such a test, if it is eventually carried out, would be to fracture -- or crack -- the gas-bearing rock a mile and a half to two miles underground. Nuclear explosive fracturing could increase production of natural gas by substantially more than conventional fracturing methods.

Participating in the study are the U. S. Atomic Energy Commission and the U. S. Department of the Interior. El Paso Natural Gas Company and these two government agencies are currently also engaged in Project Gasbuggy, the world's first experiment in fracturing a natural gas reservoir with a nuclear explosive. The Project Gasbuggy detonation occurred December 10, 1967, in northwestern New Mexico.

WHY STUDY THE PINEDALE UNIT?

The demand for natural gas energy in the United States is growing at a very rapid rate. In the past 50 years the use of natural gas has increased nearly 20 times. Today, natural gas supplies a third of the nation's energy. The amount of natural gas consumed each year is expected to double in the next 30 years.

The Pinedale Unit natural gas field contains substantial quantities of gas in place which could make an important addition to the nation's natural gas supply. However, an efficient, economic method must be developed for producing that gas.

The Pinedale Unit (see attached map) consists of about 90,000 acres of oil and gas leases held by El Paso Natural Gas Company, Mountain Fuel Supply Company and Hondo Oil Co. In the interest of efficient development of the Unit and conservation of a valuable natural resource, the leaseholders pooled their holdings to form a single unit with El Paso Natural Gas Company as Unit operator.

A 13,551-acre portion of the Unit that has already been explored has been estimated to contain about four trillion cubic feet of natural gas between the depths of 7,500 feet and 10,700 feet. El Paso Natural officials believe that much more of the Unit acreage and also the deeper horizons contain great quantities of gas.

The natural gas lies trapped in sandstone layers more than 7,500 feet below the surface. The gas is actually held in the microscopic pore spaces between the individual sand grains that make up the sandstone. The amount of pore space is small (less than five percent of the total rock volume) and the pores are poorly connected. This kind of rock is said to have low permeability; that is, the gas flows with difficulty from pore to pore

through the surrounding area to a well drilled into the rock.

Eight wells have been drilled in the Pinedale Unit. The rate of flow and the total amount of gas that can be produced from these wells will not repay the drilling costs and do not justify the expense of building pipelines to connect the wells to a market outlet.

The nuclear explosive fracturing technique tested in the Project Gasbuggy experiment may be the key to unlock these and other similar deposits of natural gas in the United States.

NUCLEAR VERSUS CONVENTIONAL STIMULATION

Two methods of well stimulation (or completion) are in common use in the United States. One is "shooting" with nitroglycerin. The other is using liquids under high pressure. The object of both methods is to fracture the underground rock containing the gas, thus creating new and better pathways for the gas to flow through the rock to the well bore.

A nuclear explosive would be expected to accomplish the same result, but on a vastly greater scale. The nuclear explosive is concentrated power; an entire nuclear explosive assembly can be packaged in a cylindrical canister a foot or so in diameter and several feet long. Into this small package can be built the energy equivalent of many thousands of tons of chemical explosives.

When detonated deep underground, a nuclear explosive creates a "chimney" -- a roughly cylindrical chamber filled with broken rock -- and a network of fractures radiating outward from the chimney through the surrounding rock. Gas may be produced from this

chimney through a well drilled into it from the surface.

WHAT THE PINEDALE UNIT STUDY WILL COVER

The Pinedale Unit study will cover every factor bearing on the engineering feasibility, economics and safety of a possible nuclear detonation deep underground, as was the case in Project Gasbuggy. Detailed information will be gathered and analyzed on the characteristics of the subsurface earth and rock, its chemical composition, on underground water, and the rock strata in which most of the gas is located.

Every natural geographic feature and man-made structure will be examined for a distance of several miles from any potential experiment site. The purpose will be to determine effect of the slight ground motion that might be expected from an explosion deeper than a mile and a half below the surface.

Radioactivity would not be expected to be a problem in any experiment that might result from the study, since Project Gasbuggy and more than 250 other subsurface nuclear explosions have demonstrated that all radioactivity can be contained completely underground.

During the study, investigation teams will be in western Wyoming from time to time to gather information. In carrying out their activities they will occasionally request assistance and cooperation of local residents.

In addition, El Paso Natural plans to drill an exploratory well in the Pinedale Unit later this year. The location under consideration is shown on the attached map. Samples of rock strata (called core samples) will be obtained and various tests will be run to gather data on the subsurface environment.

If the results of the study are favorable, an experiment will be designed and proposed to the government. No experiment will be proposed unless the study shows it to be both worthwhile and safe.

The El Paso Natural Gas study and the one designated as the Wyoming Atomic Stimulation Project are separate investigations.

The only connection between the two is that both may -- or may not -- eventually result in Gasbuggy-type projects, both are investigating sites in the same general geographical area, and both are working in cooperation with the Atomic Energy Commission and the Department of the Interior.

THE PROJECT GASBUGGY EXPERIMENT

Project Gasbuggy involved the detonation of a nuclear explosive in a natural gas reservoir east of Farmington, New Mexico, on December 10, 1967. It took place after several years of planning and intensive evaluation of the location. The knowledge and experience gained from more than 200 previous underground nuclear explosive tests by the Atomic Energy Commission and the care exercised in planning and execution resulted in the conduct of a completely safe experiment.

The explosion, at 4,240 feet below the surface, created a "chimney" about 160 feet in diameter and about 330 feet tall.

More than 200 million cubic feet of natural gas has been withdrawn from the chimney in production tests since a well was drilled into the chimney about a month after

the explosion.

Production tests are still in progress to determine how effective the explosion was in stimulating the reservoir. All gas produced during the production tests is being flared (burned) at the experiment site.

Knowledge gained from the Project Gasbuggy experiment will be invaluable, not only in additional gas reservoir stimulation experiments but also in possible applications such as creating underground storage for water and hydrocarbons, mining copper, and producing oil from oil shale.

ABOUT EL PASO NATURAL GAS COMPANY

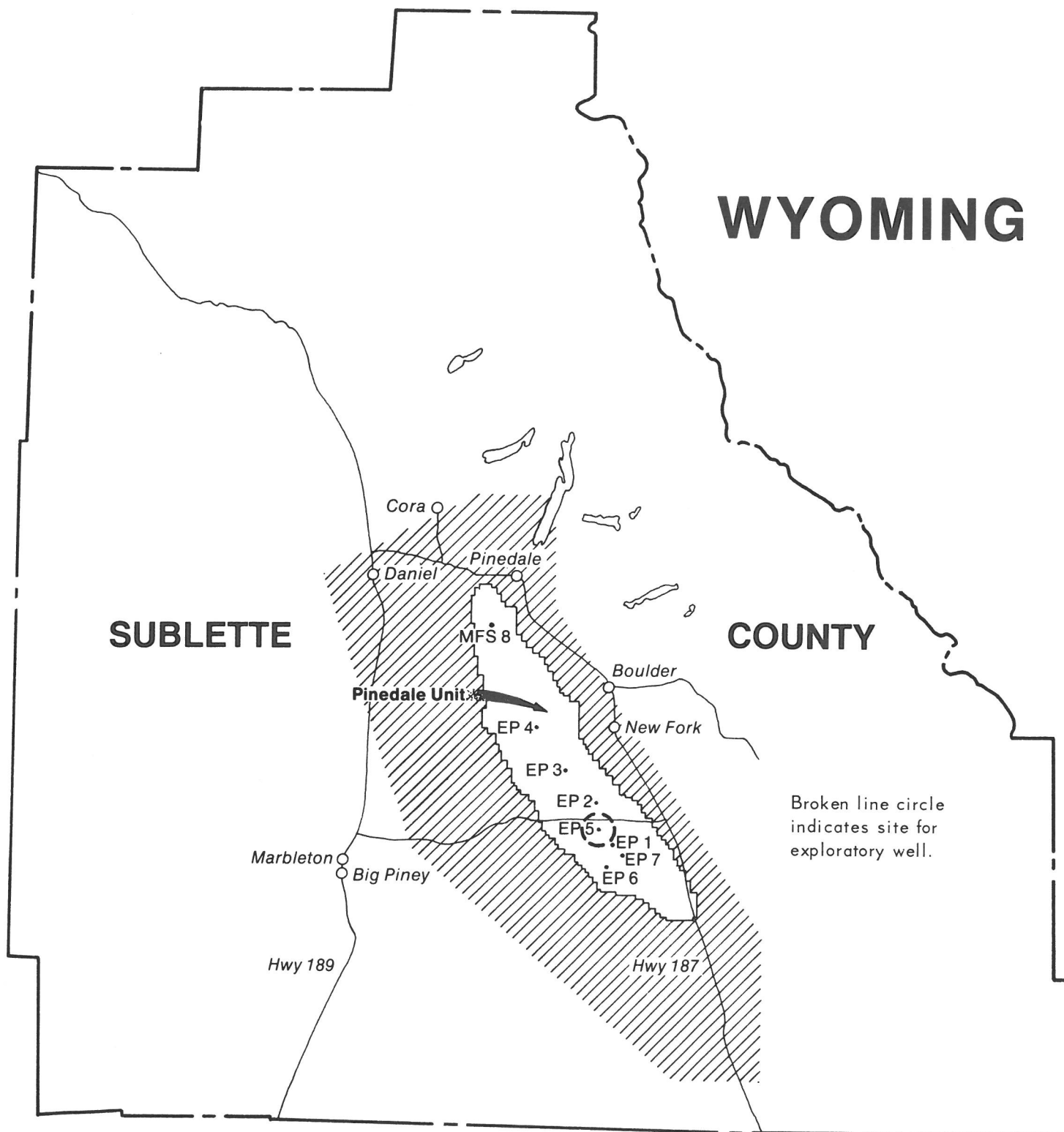
El Paso Natural Gas Company is a natural gas transmission firm which serves customers in 11 western states through a 21,000-mile pipeline network. In addition, it has interests in the fields of petrochemicals, plastics, synthetic fibers, textiles, agricultural chemicals, wire fabrication, oil and gas production, insurance, mining, and the utilization of nuclear explosives for industrial purposes. The company's home office is in El Paso, Texas.

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WYOMING

SUBLETTE

COUNTY



Broken line circle
indicates site for
exploratory well.

Study Area