PROJECT
# facts

DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY

OIL recovery
PROGRAM

# $CO_2$ HUFF-N-PUFF — TEXACO'S OIL RECOVERY FIELD PROJECT IN NEW MEXICO

**PRIMARY PROJECT PARTNER**
**Texaco Exploration and Production, Inc.**
Midland, TX

**FOSSIL ENERGY PROGRAM**
**Oil Recovery Field Demonstrations**

**MAIN SITE**
**Vacuum Field**
Lea Co., NM
near Hobbs, NM

**TOTAL ESTIMATED COST**
**$2.6 million**

**COST SHARING**
**DOE - $1.2 million**
**Non-DOE - $1.4 million**

DE-FC22-93BC14986

## Project Description

Texaco Exploration and Production, Inc., is preparing to demonstrate an innovative oil recovery technology in the Permian Basin of Texas and New Mexico. The technique is called carbon dioxide ($CO_2$) "huff-n-puff." It involves injecting $CO_2$ into the reservoir, but rather than using one well to inject the $CO_2$ and another well several hundred feet away to recover the oil, the "huff-n-puff" technique uses a single well.

Texaco began by modeling the geologic characteristics of the Vacuum Field in Lea County, New Mexico. Four candidate producing wells with varying reservoir conditions were selected for the demonstration project. For each well, as much as 1500-3000 tons of $CO_2$ will be injected, creating the "huff." The wells will be temporarily shut in for a soak period, lasting from 1 to 4 weeks. During this time, the $CO_2$ will combine with the oil and reduce its viscosity, making it easier to move through the reservoir. When the wells are reopened, the mobilized oil will be swept to the wellbore by the existing waterflood, creating the "puff."

The project is on schedule. A field demonstration site was selected and computer simulation of the movement of $CO_2$ and oil recovery have been completed. $CO_2$ injection began in November 1995. As of January 1996, following the "soak" period, the flowing tubing pressure remains at a satisfactory level, and oil production remains constant, with a considerable reduction in produced water.

## Program Goal

DOE's Oil Recovery Class Demonstration Program includes industry input on technologies needed to overcome barriers to production in various reservoirs. In some of the smaller Permian Basin fields, industry considers a full-scale $CO_2$ flood too costly under current market conditions. Texaco proposed the relatively inexpensive $CO_2$ "huff-n-puff" technique as an approach that could bridge gap to the larger project, providing interim revenue from near-term production to help offset cash outlays. The DOE cost sharing provided relief from associated research and development risks, allowing Texaco to evaluate whether a technology used successfully in other circumstances could be adapted to the Permian Basin.

$CO_2$ "huff-n-puff" has been used in Gulf Coast sandstone reservoirs, but sparingly in carbonate reservoirs. A one-well "mini-test" by Texaco at an unrelated lease showed highly significant production gains. If Texaco's current Vacuum Field project is successful, $CO_2$ injection could be the next major advancement in sustaining the flow of crude oil from the nation's most productive oil regions. Even a small gain in overall production would mean a significant addition to the nation's oil reserves, as the Permian Basin produces more than a million barrels a day.

## Project Partners

**TEXACO EXPLORATION AND PRODUCTION, INC.**
Midland, TX

**NEW MEXICO PETROLEUM RECOVERY RESEARCH CENTER**
Socorro, NM

**21 INDUSTRY PARTNERS**
Central Vacuum Unit
Lee County, NM

# $CO_2$ Huff-n-Puff — Texaco's Oil Recovery Field Project in New Mexico


## CONTACT POINTS

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## Project Benefits

The Permian Basin of Texas and New Mexico is one of the Nation's most prolific oil production regions. Nearly 1.2 million barrels per day of crude oil come from the Basin. Much of the production is from shallow-shelf carbonate reservoirs, so named because they were formed from the near-shore areas of ancient oceans.

Today, however, production from the Permian Basin carbonate reservoirs is declining. Although substantial oil remains unproduced, the production rates from many fields have dropped to the point where continued operations are economically unfeasible. Millions of barrels of recoverable oil are at risk of being abandoned.

For this reason, the Department of Energy designated the shallow-shelf carbonate reservoirs as its second priority class – Class II – for the field projects that can demonstrate ways to keep these fields in production.

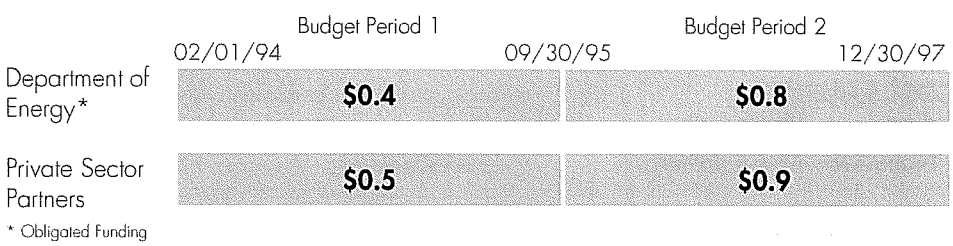
The Texaco project is one of the most promising of these approaches. $CO_2$ flooding has been used in the region for several years to produce oil after traditional primary recovery and waterflooding have been exhausted. In a full-scale miscible flood, $CO_2$ is injected into one portion of the reservoir and forced through the oil-bearing zone, pushing ahead of it additional oil to a production well.

For many properties, particularly smaller isolated leases, the expense of a full-scale $CO_2$ flooding project could never be justified, particularly in times of low oil prices. The less complex, less expensive "huff-n-puff" process offers an attractive option.

For larger properties, applying the "huff-n-puff" process first could give operators an indication of the reservoir's responsiveness to a full-scale $CO_2$ flood. Because it is expected to produce additional crude oil relatively quickly, the technique could create an up-front cash flow that could give an operator the financial capability to fund a full $CO_2$ flood. Finally, operators could use the "huff-n-puff" process on outlying, non-targeted acreage while the full-scale $CO_2$ flood is taking place through the main portion of the reservoir.

Since the infrastructure is already in place in the Permian Basin to deliver $CO_2$ to most fields, the Texaco project offers an attractive and potentially affordable alternative to many regional producers faced today with the alarming prospects of shutting in valuable oil properties.

## Cost Profile (Dollars in Millions)




* Obligated Funding

## Key Milestones