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Environmental

DOE/BC/98000467 Comparative Analysis Of EPA Cost-Benefit Methodologies. Argonne National Laboratory. May 1998. 24 pp. Order No. DE98000467. This report reviews cost-benefit methodologies used by three EPA program offices: Office of Air and Radiation, Office of Solid Waste, and Office of Water. These offices were chosen because they promulgate regulations that affect the policies of this study's sponsor (U. S. Department of Energy, Office of Fossil Energy) and the technologies it uses. The study was conducted by reviewing 11 RIAs recently published by the three offices and by interviewing staff members in the offices. This study focused on the consistency of the approaches as well as their strengths and weaknesses.

Field Demonstration

DOE/BC/14896-22 Geology And Petrophysical Characterization Of The Ferron Sandstone For 3-D Simulation Of A Fluvial-Deltaic Reservoir. Annual. October 1, 1996 - September 30, 1997. Utah Geological Survey. May 1998. Order No. 9800480. The objective of the Ferron Sandstone project is to develop a comprehensive, interdisciplinary, quantitative characterization of a fluvial-deltaic reservoir to allow realistic interwell and reservoir-scale models to be developed for improved oil-field development

in similar reservoirs world-wide. During fiscal year 1996-97, lithofacies, measured sections, vertical and horizontal scales, and other data were plotted on photomosaics of the Ferron Sandstone outcrop belt within the study area for both the regional analyses.

DOE/BC/14936-10 Geological And Engineering Characterization Of Geraldine Ford Field, Reeves And Culberson Counties, Texas. Topical. Bureau of Economic Geology, The University of Texas at Austin. April 1998. 115 pp. Order No. 9800477. The objective of this Class III project is to demonstrate that detailed reservoir characterization of clastic reservoirs in basinal sandstones of the Delaware Mountain Group in the Delaware Basin of West Texas and New Mexico is a cost-effective way to recover more of the original oil in place by strategic infill-well placement and geologically based field development. The study focused on Geraldine Ford Field, which produces from the upper Bell Canyon Formation (Ramsey sandstone). Geraldine Ford field is located in Reeves and Culberson Counties, Texas. The results indicate that 10 to 30 percent (1 to 3 MMbbl) of remaining oil in place in the demonstration area can be produced by CO2 injection.

DOE/BC/14936-10 (Appendix I) Geological And Engineering Characterization Of Geraldine Ford Field, Reeves And Culberson Counties, Texas. Topical. Bureau of Economic Geology, The University of Texas at Austin. April 1998. Order No. 9800474.

DOE/BC/14936-10 (Appendix II) Geological And Engineering Characterization Of Geraldine Ford Field, Reeves And Culberson Counties, Texas. Topical. Bureau of Economic Geology, The University of Texas at Austin. April 1998. Order No. 9800475.

DOE/BC/14936-10 (Appendix III) Geological And Engineering Characterization Of Geraldine Ford Field, Reeves And Culberson Counties, Texas. Topical. Bureau of Economic Geology, The University of Texas at Austin. April 1998. Order No. 9800476.

DOE/BC/14938-8 Advanced Reservoir Characterization In The Antelope Shale To Establish The Viability Of CO2 Enhanced Oil Recovery In California's Monterey Formation Siliceous Shales. Annual. February 7, 1997 to February

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MASTER

1998. Chevron USA Production Company. June 1998. 200 pp. Order No. DE98000484. The primary objective of this research is to conduct advanced reservoir characterization and modeling studies in the Antelope Shale reservoir. Characterization studies will be used to determine the technical feasibility of implementing a CO₂ enhanced oil recovery project in the Antelope Shale in Buena Vista Hills Field. The proposed pilot consists of four existing producers on 20 acre spacing with a new 10 acre infill well (653Z) drilled as the pilot CO₂ injector. Most of the reservoir characterization during Phase I of the Project will be performed using data collected in the pilot pattern wells.

DOE/BC/14942-5 **Advanced Reservoir Characterization And Evaluation Of CO₂ Gravity Drainage In The Naturally Fractured Spraberry Trend Area.** Annual. September 1, 1996 to August 31, 1997. Pioneer Natural Resources. June 1998. 122 pp. Order No. DE98000478. The overall goal of this project is to assess the economic feasibility of CO₂ flooding the naturally fractured Spraberry Trend Area in West Texas. This objective is being accomplished by conducting research in four areas: 1) extensive characterization of the reservoirs, 2) experimental studies of crude oil/brine/rock (COBR) interactions in the reservoirs, 3) reservoir performance analysis, and, 4) experimental investigations on CO₂ gravity drainage in Spraberry whole cores. This report provides results of the second year of the five-year project for each of the four areas.

DOE/BC/14951-22 **Integrated Approach Towards The Application Of Horizontal Wells To Improve Waterflooding Performance.** Annual. January 1, 1997 to December 31, 1997. University of Tulsa. May 1998. 49 pp. Order No. DE98000479. This annual report describes the progress during the fifth year of the project on "Integrated Approach Towards the Application of Horizontal Wells to Improve Waterflooding Performance". This report covers the results of the implementation from the first stage of the project. It discusses the work accomplished so far for the second stage of the project.

DOE/BC/14953-20 **Increased Oil Production And Reserves From Improved Completion Techniques In The Bluebell Field, Uinta Basin, Utah.** Annual. October 1, 1996-September 30, 1997. Utah Geological Survey. May 1998. 66 pp. Order No. 98000481. The Bluebell Field is productive from the Tertiary lower Green River and Colton (Wasatch) Formations of the Uinta Basin, Utah. A two year characterization study involved detailed examination of outcrop, core, well logs, surface and subsurface fractures, produced oil-field waters, engineering parameters of the two demonstration wells, and analysis of past completion techniques and effectiveness. The study is intended to improve the geologic characterization of the producing formations and thereby develop completion techniques specific to the producing beds or facies instead of a shot gun approach to stimulating all the beds. A novel stochastic approach was developed to generate fracture frequency distributions.

DOE/BC/14983-13 **Recovery Of Bypassed Oil In The Dundee Formation Using Horizontal Drains.** Annual. March 1996 to March 1997. Michigan Technologi-

cal University. April 1998. 44 pp. Order No. DE98000473. This Class II field project has demonstrated that economic quantities of hydrocarbons can be produced from abandoned or nearly abandoned fields in the Dundee Formation of Central Michigan using horizontal drilling technology. The site selected was Crystal field in Montcalm County, Michigan. A horizontal well, the TOW 1-3, drilled as a field demonstration pilot was successful, producing at a rate of 100 bbls of oil per day with a zero water cut. Although capable of producing 500+ bbls/day, the production rate is being kept low deliberately to try to prevent premature water coning.

DOE/BC/14986-13 **CO₂ Huff-n-Puff Process In A Light Oil Shallow Shelf Carbonate Reservoir.** Annual. January 1, 1996 to December 31, 1996. Texaco Exploration & Production Inc. January 1998. 44 pp. Order No. DE98000468. It is anticipated that this project will show that the application of the CO₂ Huff-n-Puff process in shallow shelf carbonates can be economically implemented to recover appreciable volumes of light oil. The goals of the project are the development of guidelines for cost-effective selection of candidate reservoirs and wells, along with estimating recovery potential.

General Research

DOE/BC-98/1/SP **Supporting Technology For Enhanced Oil Recovery EOR Thermal Processes.** US Dept of Energy & Ministry of Energy and Mines-Republic of Venezuela. December 1997. Order No. DE98000459. This report contains the results of efforts under the six tasks of the Ninth Amendment and Extension of Annex IV, Enhanced Oil Recovery Thermal Processes of the Venezuela/USA Agreement. The report is presented in sections (for each of the 6 tasks) and each section contains one or more reports prepared by various individuals or groups describing the results of efforts under each of the tasks.

DOE/BC-98/2/SP **Reservoir Class Field Demonstration (Publication & Presentation Bibliography).** Annual. January 1, 1997 to December 31, 1997. National Petroleum Technology Office. December 1997. 91 pp. Order No. DE97007190. The Reservoir Class Field Demonstration Program was initiated in FY92 in response to rapidly declining domestic production and the realization that huge volumes of oil are being abandoned in reservoirs because of uneconomic production techniques. This program is just one of the critical elements of the National Oil Program necessary to move Improved Oil Recovery (IOR) technology from the conceptual stage through research, pilot scale field experiments, and full-scale field demonstrations to industry acceptance and commercialization. Both the successful results and failures of the field demonstrations will provide focus to concurrent research programs. Elements of the field demonstrations that are suitable for broad industry application are being communicated to the industry through the oil program's technology transfer effort.

DOE/BC/14977-13 **Improved Efficiency Of Miscible**

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CO2 Flooding Heterogeneous Reservoirs. Final. April 17, 1994-May 31, 1997. New Mexico Petroleum Recovery Research Center/NM Institute of Mining and Technology. February 1998. Order No. DE98000471. In Task 1, we studied a unique foam property, selective mobility reduction (SMR), that effectively reduces the effects of reservoir heterogeneity. In Task 2, a model required for reservoir performance predictions was developed for foam mechanisms and properties, and incorporated into a fully compositional simulator and a pseudo-miscible reservoir simulator. Multiphase flow behavior in fractured reservoirs was also investigated in Task 3. The fourth Task of this project was the transfer of information to the public domain.

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DOE/PC/91008-5

Fractured Reservoir Discrete Feature Network Technologies.

Annual. March 7, 1996 - February 28, 1997. Golder Associates Inc. January 1998. Order No. DE98000469. This report describes progress on the project, "Fractured Reservoir Discrete Feature Network Technologies" during the period March 7, 1996 to February 28, 1997. The report presents summaries of technology development for the following research areas: (1) development of hierarchical fracture models, (2) fractured reservoir compartmentalization and tributary volume, (3) fractured reservoir data analysis, and (4) integration of fractured reservoir data and production technologies. In addition, the report provides information on project status, publications submitted, data collection activities, and technology transfer through the world wide web (WWW).

DOE/ID/13421

Evaluation Of Reservoir Wettability And Its Effect On Oil Recovery.

Annual. February 1, 1996 to January 31, 1997. New Mexico Petroleum Recovery Research Center. March 1998. Order No. DE98000472. We report on studies aimed at characterizing both the acid/base and asphaltene components. Standard acid and base number procedures were modified and 22 crude oil samples were tested. In characterizing the asphaltenes we focused on their solvent environment. We quantify solvent properties by refractive index measurements and report the onset of asphaltene precipitation at ambient conditions for nine oil samples. Four categories of interaction mechanisms can be demonstrated to occur when crude oils contact solid surfaces: polar interactions can occur on dry surfaces, surface precipitation is important if the oil is a poor solvent for its asphaltenes, and acid/base and ion-binding interactions occur in the pres-

ence of water. Specific instances when each of these mechanisms is dominant can be identified using crude oils of different acid number, base number, and solvent quality. This project is also devoted to improved assessment of wetting.

Reservoir Characterization

DOE/BC/14894-15

Application Of Artificial Intelligence To Reservoir Characterization: An Interdisciplinary Approach. Final. August 31, 1997. University of Tulsa. March 1998. Order No. DE98000465.

The primary goal of the project is to develop a user-friendly computer program to integrate geological and engineering information using Artificial Intelligence (AI) methodology. The project is restricted to fluvially dominated deltaic environments.

Supporting Research

DOE/BC/14833-5

National Geosciences Data Repository System Phase II. Final.

January 30, 1995 to January 28, 1997. American Geological Institute. April 1998. 119 pp. Order No. DE98000458. This report summarizes the results of Phase II of the American Geological Institute's project to establish a National Geoscience Data Repository System (NGDRS). The project's primary objectives are to transfer private-sector geoscience data in jeopardy of being destroyed to public-domain repositories and to make these and other geoscience data easily accessible to those who have a need to use it in future investigations. This project will make many of these data available to the geoscience community for the first time.

DOE/PC/91008-6

Removal Of Asphaltene And Paraffin Deposits Using Micellar Solutions And Fused Reactions. Final. 1995-1997. University of Michigan.

May 1998. 149 pp. Order No. DE98000482. Chemical treatments of paraffin and asphaltene deposition by means of cleaning fluids were carried out in this research project. Research focused on the characterization of asphaltene and paraffin materials and dissolution of asphaltene deposits using surfactant/micellar fluids developed early in the project. The key parameters controlling the dissolution rate were identified and the process of asphaltene/paraffin dissolution were examined using microscopic apparatus. Numerical modeling was also carried out to understand the dissolution of paraffin deposits.

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1. DOE/BC-88/1/SP. **EOR Predictive Models**: Handbook for Personal Computer Versions of Enhanced Oil Recovery Predictive Models. BPO Staff. February 1988. 76 pp. NTIS Order No. DE89001204. FORTRAN source code and executable programs for five EOR Predictive Models shown below are available. The five recovery processes modeled are Steamflood, In-Situ Combustion, Polymer, Chemical, and CO₂ Miscible Flooding. The models are available individually. Min Req.: IBM PC/XT, PS-2, or compatible computer with 640 Kbytes of memory.
 - a- DOE/BC-86/6/SP. **Steamflood Predictive Model**, Supporting Technology for Enhanced Oil Recovery. Dec 1986, 594 pp. NTIS Order No. DE87001219.
 - b- DOE/BC-86/7/SP. **In-Situ Combustion Predictive Model**, Supporting Technology for Enhanced Oil Recovery. Dec 1986, 263 pp. NTIS Order No. DE86000264.
 - c- DOE/BC-86/10/SP. **Polymer Predictive Model**, Supporting Technology for Enhanced Oil Recovery. Dec 1986, 394 pp. NTIS Order No. DE87001207.
 - d- DOE/BC-86/11/SP. **Chemical Flood Predictive Model**, Supporting Technology for Enhanced Oil Recovery. Dec 1986, 360 pp. NTIS Order No. DE87001208.
 - e- DOE/BC-86/12/SP. **CO₂ Miscible Flood Predictive Model**, Supporting Technology for Enhanced Oil Recovery. Dec 1986, 469 pp. NTIS Order No. DE87001209.
2. DOE/BC-95/2/SP. **Infill Drilling Predictive Model**: User's Guide and Documentation Manual - Release 1.2.0, 1995 for the PC. FORTRAN source code and executable program. Min Req.: 80386/80387, DOS v3.1, and 2 Mbytes extended memory.
3. **Infill Drilling Predictive Model: Windows Version 1.1**: June 1995. This is an update to the Infill Drilling Predictive Model (IDPM) released in 1995 (DOE/BC-95/2/SP). This version runs out of the Microsoft Windows environment and supports post-processing graphics. Min Req.: 80386, 4 Mbytes extended memory, and Windows v3.1.
4. **Polymer/Waterflood Predictive Model: Window Version 1.1**: June 1995. This is an update to the Polymer Flood Predictive Model (PFPM) released in 1986 (DOE/BC-86/10/SP). An addendum is available describing the update economic cost and tax functions included in this release. This serves as a supplement to the original PFPM user's manual. This version runs out of the Microsoft Windows environment and supports post-processing graphics. Min Req.: 80386, 4 Mbytes extended memory, and Windows v3.1.
5. **CO₂ Miscible Predictive Model: Windows Version 1.1**: 1995. This is an update to the CO₂ Miscible Flood Predictive Model (CO2PM) released in 1986 (DOE/BC-86/12/SP). This version runs out of the Microsoft Windows environment and supports post-processing graphics. Min Req.: 80386, 4 Mbytes extended memory, and Windows v3.1.
6. **CO₂ Prophet**: Water and CO₂ Flood Prediction Software. CO₂ Prophet, conceived by Texaco Exploration and Production Technology Department (EPTD), was partially developed as part of the DOE Class I cost share program "Post Waterflood, CO₂ Flood in a Light Oil, Fluvial Dominated Deltaic Reservoir" under DOE Contract No. DE-FC22-93BC14960. Min

Req.: 80386/80387 and 4 Mbytes extended memory and will run under the Microsoft Windows environment. The DOE does not provide technical support for this application.

7. DOE/BC-89/3/SP. Handbook for Personal Computer Version of **BOAST II**: A Three-Dimensional, Three-Phase Black Oil Applied Simulation Tool. Bartlesville Project Office. January 1989. 82 pp. NTIS Order No. DE89000725. FORTRAN source code and executable program. Min. Req.: IBM PC/AT, PS-2, or compatible computer with 640 Kbytes of memory.
8. **BOAST-VHS**: FORTRAN source code and executable program. User's Guide and Documentation Manual, NIPER-542, National Institute for Petroleum and Energy Research (NIPER). January 1992. 92 pp. NTIS Order No. DE92001021. Min. Req.: IBM PC/AT, PS-2, or compatible computer with 640 Kbytes of memory. Math coprocessor optional.
9. **BOAST-3**: FORTRAN Source code and executable program. User's Guide and Documentation Manual. Bartlesville Project Office, September 21, 1996 (version 1.6). BOAST-3 is a modified version of BOAST-II containing postprocessors COLORGRID and B3PLOT2. The executable was compiled with the 32-bit Microsoft PowerStation FORTRAN and is 100% compatible with Windows. Min Req.: 386/486 PC environment.
10. DOE/BC-91/2/SP. **MASTER**: Miscible Applied Simulation Techniques for Energy Recovery - Version 2.0. User's Guide and Technical Manual. Morgantown Energy Technology Center (METC). February 1991. 192 pp. NTIS Order No. DE91002222. FORTRAN source code and executable program. Min. Req.: See Users Guide.
11. NIPER-705. **PC-GEL**: A Three-Dimensional, Three-Phase, Permeability Modification Simulator. IIT Research Institute, National Institute for Petroleum and Energy Research (NIPER). October 1993. 190 pp. NTIS Order No. DE94000104. FORTRAN source code and executable program. Min. Req.: IBM PC/AT, PS-2, or compatible computer with 640 Kbytes of memory. Math coprocessor optional
12. DOE/BC/20006-18. **TRACRL-Single-Well Chemical Tracer Test Simulator**. A deliverable as part of "The Single-Well Chemical Tracer Method for Measuring Residual Oil Saturation-Final Report." Bartlesville Energy Technical Center (BETC), predecessor to National Institute for Petroleum and Energy Research (NIPER). October 1980. 190 pp. FORTRAN source code and sample input datasets for both PC and Apple environments. Executable program for the PC.
13. **UTCHEM**: A Three-Dimensional Chemical Flood Simulator, version 5.1, May 1992. Developed under the Enhanced Oil and Gas Recovery Research Program at the Center for Petroleum and Geosystems Engineering, The University of Texas at Austin. Software is not distributed or supported by the DOE. Contact Dr. Gary Pope at (512) 471-7234 for details.
14. **NPC Public Database**: (NPCPUBDB.GEO) Database developed for the National Petroleum Council (NPC) for its 1984 assessment of the nation's enhanced oil recovery (EOR) potential. The technical data description is at the reservoir level. Included with the database are the Appendices from the "TORIS Data Preparation Guidelines" (NIPER/BDM-0042) defining the data elements in the database. Available in ASCII or Spreadsheet format.
15. **CLEVER**: Class Evaluation Executive Report, v2.0, December 1995. Database application describing information from the DOE's Geologic/Reservoir Class Program. Developed at National Institute for Petroleum and Energy Research (NIPER) by BDM-Oklahoma, Inc. This includes administrative and general technical data. Covers Classes 1 - 3. Distributed as an executable PC program, FoxPro application not required. Min Reqs.: Windows v3.1 and an 80386 processor.

16. **Crude Oil Analysis Database:** COADB, v2.0, 1995. Database contains information on 9,056 crude oil analyses performed at the National Institute for Petroleum and Energy Research (NIPER). The database is publicly available via a Bulletin Board System (BBS) by dialing (918) 337-4440. A user's guide is available from the BBS in Microsoft Word v6.0. A printed user's guide is available by request, NIPER/BDM-0151. The database is also available on disk. Min Reqs.: DOS v5.0, 80386 processor, 4 MB RAM, and 20 MB hard disk memory.
17. **Risk Analysis and Decision Making Software:** Software package includes tools for Monte Carlo simulation, best fit for distributed functions, sample or rank correlation, investment risk analysis, and EOR method screening. Developed at National Institute for Petroleum and Energy Research (NIPER) by BDM-Oklahoma, Inc. A printed user's guide is available by request, NIPER/BDM-0227. Min Req. Windows v3.11, 8 MB hard disk space, 8 MB RAM, VGA color monitor, and an 80486 processor.
18. **FRAC-EXPLORE:** FRAC-EXPLORE analyzes the characteristics and patterns of subsurface lineaments, fractures, and other geological features for the purpose of identifying the locations of potential subsurface oil and gas reservoirs. Developed at National Institute for Petroleum and Energy Research (NIPER) by BDM-Oklahoma, Inc. A printed user's guide is available by request, NIPER/BDM-0261. Min Req. Windows v3.1, 6 MB hard disk space, 4 MB RAM, VGA color monitor configured to at least 800x600 resolution, and an 80386 processor.
19. **Microbial Transport Simulator:** The microbial transport simulator (MTS) is a three-dimensional, three-phase, multiple-component numerical model that permits the study of the transport of microorganisms and nutrients in porous media. Microbial parameters incorporated into MTS include: Microbial growth and decay, microbial deposition, chemotaxis, diffusion, convective dispersion, tumbling, and nutrient consumption. Governing equations for microbial and nutrient transport are coupled reservoir. The model's mathematical formulations and preparation procedures of data files for conducting simulations using MTS are described in the electronic manual. Min. Req.: IBM PC/AT, PS-2, or compatible computer with 640 Kbytes of memory. Math coprocessor optional.

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