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Oil and Gas Data Infrastructure Project Final Report CRADA No. TO-1111-95

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Disclaimer

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Oil and Gas Data Infrastructure Project

Project Accomplishments Summary
CRADA No. TO-1111-95

Date: November 14, 2000 Revision: 2

A. Parties

The project is a relationship between the Lawrence Livermore National Laboratory (LLNL) and the following organizations:

University of California
Lawrence Livermore National Laboratory
7000 East Avenue, L-795
Livermore, CA 94550

Minerals Management Service
Robert Paul (805-389-7702)
Regional Supervisor for Resource Evaluation
770 Paseo Camarillo
Camarillo, CA 93010

Bureau of Land Management
Joe Chesser (505-438-7407)
NM (922)
P.O. Box 27115
Santa Fe, NM 87502-7115

Long Beach Department of Oil Properties/THUMS
Xen Colazas (310-590-6878)
Department of Oil Properties
211 E. Ocean Blvd
Suite 500
Long Beach, CA 90802

Texas A&M University
Richard Startzman (409-847-9095)
Director, Petroleum Engineering Dept
Crisman Institute
Texas A&M University
College Station, TX 77843-3116

California Division of Oil and Gas
Bill Guerard, Jim Campion, Mike Gardner (916-445-9686)
State Oil and Gas Supervisor
801 K St. MS 20
Sacramento, CA 95814-3530

Railroad Commission of Texas
Hope Morgan (512-463-7249)
Director, Information Technology Services
1701 N. Congress
P.O. Box 12967
Austin, TX 78711-2967

California State Lands Commission
Paul Mount, Marina Voskanian (310-590-529 1)
200 Oceangate, 12th Floor
Long Beach, CA 90802

California Independent Petroleum Association
Dan Kramer (916-447-1185)
111211 St., Suite 350
Sacramento, CA 95814-2823

Texas Independent Producers and Royalty Owners Association
Scott Anderson (512-477-4452)
Executive Vice-President
515 Congress Ave., Suite 1910
Austin, TX 78701

B. Background

Obtaining a substantially complete set of the relevant data for an oil or gas producing property is a very time-consuming and nearly impossible task which limits the producer's effectiveness in making sound business and engineering decisions. The data are located in a variety of places, some of which are completely inaccessible to the average user. Access to information on existing wells is a crucial component of a producer's ability to assess the feasibility of purchasing and operating a well. The more effective the access the producer has to the information, the greater the likelihood that a wider suite of choices can be considered and a profitable business decision reached.

California, like a number of other states, provides public access to oil and gas production data, and other types of supplemental well information. However, access

mechanisms are often ineffective, tedious, and expensive to maintain as much of the data is centrally located and in a format that is difficult to search, retrieve, and refile.

The California Division of Oil and Gas and Geothermal Resources (CADOGGR) regulates California's oil and gas drilling and production operations. The CADOGGR administers the state laws for the conservation of oil and gas resources to prevent damage to life, health, property, and natural resources. The principal mandated objectives in regulating oil and gas exploratory, development, and production operations are to prevent conditions that may be hazardous to health or damaging to the environment. As part of the regulatory program, well records are maintained on each well. There is information for each well consisting of applications to dowork, permits issued, drilling and exploration histories, geophysical logs, production data, maps, reports, test results, well logs, abandonment and other types of information which the producers are required to provide to the states on an on-going basis. These well records are also considered vital to the industry because they are the only complete source of public information needed for continued exploration and development work. Making copies of the well records available to the industry and the public is an important function.

C. Description

The OGDIP project has developed a Java-based computer application for Internet access to all electronic oil and gas data currently available at CADOGGR. The first prototype application developed (in Perl) by this project is still used extensively by oil and gas professionals throughout California. Experience with this prototype, user feedback, and new Internet technology have led us to new interface and database designs which provide higher performance and greater functionality. Completion of this application during early 1998 was our highest priority.

This database includes historical statistics on oil, gas, and water production for all California active oil and gas fields starting in 1977. For every well or lease in these active fields, the user can access the production data for any selected period between 1977-1997. This first module also has the capability of providing production data for any selected operator.

The current application is NT-based, rather than Unix-based, to match the environment at CADOGGR and other state agencies; it has been built with advanced Java tools from Symantec Corporation. This prototype, combined with a newly designed database schema, provides rapid access to data through a new tab-based interface. The prototype downloads a Java applet to the user's web browser. The applet implements the interface on the client's desktop machine, as opposed to communicating with the server, and accesses the OGDIP database directly. This increases performance and our flexibility to provide new functionality.

The new application has been demonstrated to industry at several forums. We received rave reviews, with potential users anxious to see the application put into production.

While Texas has implemented a Unix-based solution to match the environment at the Railroad Commission (RRC) the underlying goals and structure of the Texas internet-based oil and gas production query application are heavily aligned with those in the California prototype. LLNL was instrumental in the development of a highly successful Oil and Gas internet design and although it does not use a Java download, it works easily for users with slower speed access to the Internet in very remote areas. The RRC application, named ACTI for the Advanced Computational Technology Initiative project, was brought on-line during 1998 and supports over 2 million public access queries each year. It provides access to monthly production information from 1993 to the most current production cycle.

USC and LLNL jointly developed a second module which includes a comprehensive reservoir and geologic database for California Oil and Gas fields. For every zone in the active California oil and gas fields, characteristics such as age, depositional system, epoch, Foram stage, etc. are catalogued. In addition to compiling the general geological characteristics of all California oil and gas fields, this module includes detailed information for three sample fields. These sample fields are representative of a large portion of all California reservoirs.

Prior to the development of the LLNL/USC electronic database for California Oil and gas fields, the geological and statistical data were offered by CADOGGR in three binders in hard copy format. CADOGGR generates, occasionally updates, and maintains these three volumes. Volume I covers Central California (Figures 1-5). The latest version of this volume is the third edition published in 1985. Volume 2 covers the Southern, Central Coastal and Offshore California (Figures 6-15). The latest version is the third edition published in 1991. Volume 3 covers the Northern California (Figures 16-19) and its latest version is the fourth editionpublished in 1982. Considering the significant volume of activities on the California Oil and gas fields in the recent years, one can imagine how outdated 1982, 1985 or even 1991 data can be. Moreover, the hard copy format would not allow any extraction, interpretation, clustering, or analysis of the statewide or sectional data.

During 1997-1998, the LLNL/USC project accomplished the following major activities:

- Development of a comprehensive database to include geological and statistical data for all California oil and gas fields as presented in the CADOGGR (California Division of Oil and Gas and Geothermal Resources) manuals volumes 1-3.

- Conversion of all existing statistical and geological data included in the CADOGGR three volumes to digital format.

- Populating the database with the digitized data.

- Development of query capabilities in the database, so statewide or specific requested data can be extracted and displayed.

- Inclusion of these data on the Internet in conjunction with other LLNL related databases.

- Development of a CD ROM with the database for submission to the CADOGGR who is the regulating organization for California oil and gas operation. CADOGGR can easily update the data on this CD ROM anytime an operator submits new information on any of the oil or gas fields.

The following list of participants had ongoing input to the website and modifications were made to the database based on their input.

Armstrong Petroleum Corporation
California Conservation Committee
University of Southern California
Florida Geological Survey (Oil & Gas Section)
New York Division of Mineral Resources
Ohio Division of Oil and Gas
Georgia Geologic Survey
North Carolina Geological Survey
Washington State Dept. of Natural Resources
Wisconsin Geological and Natural History Survey
Iowa Department of Natural Resources
Missouri Department of Natural Resources
South Carolina Dept. of Health and Environ. Control
South Dakota Dept. of Environment and Natural Resources
Nevada Division of Minerals
Colorado Oil & Gas Conservation Commission
Arizona Oil and Gas Conservation Commission
Utah Division of Oil, Gas, and Mining

Maryland Minerals, Oil & Gas Division
IOPA
Crutcher-Tufts Production Co.
Dominion Oil Co.
Gato Corporation
GEO Petroleum Inc
Graner Oil Co.
Hunter Living Trust
MacFarland Energy Inc.
Mannon Associates Inc.
Pacific Energy Resources
SABA Petroleum

Signal Hill Petroleum Inc.
St. James Oil Corporation
Santa Fe Energy Resources Inc.
Naftext Holdings
Pacific Operators Offshore, Inc.
Alferitz Resources Inc.
Brelturn Energy Corp.
Richard C. Slade and Associates
Texokan Exploration Services
CH2M Hill
Harwood Capital
Reservoir Management Group, Inc.
Pinnacle Software
Scotia Group
J. P. Oil Company, Inc.
PETROtech Resources Company
Hessler Accounting and Tax Service
Cal Energy Resources
Arena Resources Corporation

D. Expected Economic Impact

Independent producers want more effective access to this crucial information to expand their business options and support profitable decisions. Majors want the independents to have more effective access to facilitate the sale of properties where they can no longer justify producing, but which an independent might see as viable. State government wants to see more effective access for the independents to avoid the abandonment of wells which could be productive under the right circumstances.

From the beginning of the project, the notion of providing production data over the Internet has struck a chord, with agencies in many other states expressing interest in having their data accessible. The Java application can be easily adapted to process data from other states. The OGDIP project proposes to meet with other states, coordinated through the IOGCC and PTTC, to formulate plans to adapt and distribute the OGDIP system. The goal is not to collect data from other states for the OGDIP database, but to work with other agencies to incorporate the technology into their environments and to speed their own implementation of databases accessible over the Internet. Part of this effort will be to standardize data access mechanisms within the oil and gas industry across the U.S.

E. Benefits to DOE

This DEA was a project within the Advanced Computational Technology Initiative (ACTI) which was designed to enhance, apply and transfer technologies developed within the DOE National Laboratories to promote the competitiveness of domestic natural gas and oil companies and decrease the nation's dependence on foreign oil.

This project was competitively selected by the Department of Energy (DOE) which sponsored and funded this Initiative.

F. Industry Area

Oil and Gas Industry

G. Project Status

This project is completed.

H. LLNL Point of Contact for Project Information

Jeff Wagoner
LLNL, L-221
(925) 422-1374

I. Company Size and Point(s) of Contact

The partners were universities and state and federal agencies. See attached signatures.

J. Project Examples

K. Release of Information

I certify that all information contained in this report is accurate and releasable to the best of my knowledge.

Karena McKinley, Director
Industrial Partnerships
and Commercialization

1/19/01
Date

RELEASE OF INFORMATION

I have reviewed the attached Project Accomplishment Summary prepared by Lawrence Livermore National Laboratory and agree that the information about our CRADA may be released for external distribution.

Jeff Kennedy 12-7-2000

Robert Paul
Minerals Management Service

Date

RELEASE OF INFORMATION

I have reviewed the attached Project Accomplishment Summary prepared by Lawrence Livermore National Laboratory and agree that the information about our CRADA may be released for external distribution.

Joe Chesser — 12/3/2000

Joe Chesser
Bureau of Land Management

Date

RELEASE OF INFORMATION

I have reviewed the attached Project Accomplishment Summary prepared by Lawrence Livermore National Laboratory and agree that the information about our CRADA may be released for external distribution.

~~Xen Colazas~~ DM. Sullivan, Director

10/6/00

Date

THUMS

RELEASE OF INFORMATION

I have reviewed the attached Project Accomplishment Summary prepared by Lawrence Livermore National Laboratory and agree that the information about our CRADA may be released for external distribution.

12-15-2000

Richard Startzman
Texas A&M University

Date

RELEASE OF INFORMATION

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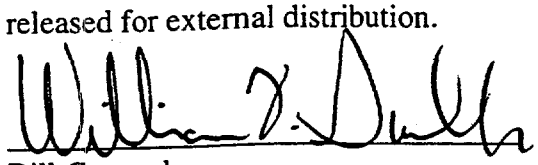

10/4/00

Bill Guerard
California Division of Oil and Gas

Date

RELEASE OF INFORMATION

I have reviewed the attached Project Accomplishment Summary prepared by Lawrence Livermore National Laboratory and agree that the information about our CRADA may be released for external distribution.

Hope Morgan 11/16/2000

Hope Morgan
Railroad Commission of Texas

Date

RELEASE OF INFORMATION

I have reviewed the attached Project Accomplishment Summary prepared by Lawrence Livermore National Laboratory and agree that the information about our CRADA may be released for external distribution.

Paul B. Mount 10/6/00

Paul Mount
California State Lands Commission

Date

RELEASE OF INFORMATION

I have reviewed the attached Project Accomplishment Summary prepared by Lawrence Livermore National Laboratory and agree that the information about our CRADA may be released for external distribution.

Oct 2, 2000

Dan Kramer
California Independent Petroleum Assn.

Date

RELEASE OF INFORMATION

I have reviewed the attached Project Accomplishment Summary prepared by Lawrence Livermore National Laboratory and agree that the information about our CRADA may be released for external distribution.

10/6/00

Scott Anderson — Date

Texas Independent Producers and Royalty Owners Assn.