Uniform Production Reporting Model

Final Report

Volume I - Report

Submitted To

The U.S. Department of Energy
Office of Fossil Energy
Morgantown Energy
Technology Center
Morgantown, West Virginia

In Completion Of

Grant: DE-FG21-93MC30084
The Feasibility Assessment of a U.S. Natural Gas Production Reporting System

Submitted By

Sarkeys Energy Center
The University of Oklahoma
Norman, Oklahoma

On

June 30, 1994

For Reporting Period

July 1, 1993 - June 30, 1994

This report was prepared by the University of Oklahoma under grants from the U.S. Department of Energy and the Governor's Office of the State of Oklahoma. The information contained herein should not be construed as advocating or reflecting any policy position of the Department of Energy or the Governor's Office of the State of Oklahoma. Additional copies of this report may be obtained by contacting the University of Oklahoma at (405) 325-3131 or the U.S. Department of Energy at (202) 586-5600.

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ABSTRACT

Natural gas can realize its full potential as a premier energy source only if the uncertainty about the availability of natural gas supplies can be eliminated. Much of this uncertainty stems from the lack of timely and accurate production information needed to support supply-planning decisions and the day-to-day functioning of the natural gas market. This information has traditionally been provided by producing state government agencies as part of their normal function. At a time when the *need* for this information is at its highest, the *ability* of producing state agencies to provide it is at its lowest. Out-dated information systems, changes in the U.S. gas and oil industry, and burdensome organizational issues are making the job of data collection and dissemination increasingly difficult.

The Uniform Production Reporting Model (UPRM) project was charged with identifying the best practices and procedures of the producing states related to the gathering, management, and dissemination of production data. The result of this project is the UPRM Conceptual Model. This model was developed with extensive input from state, federal, and industry representatives and is intended to provide producing states with a flexible framework for addressing the difficulties now facing them.

A window of opportunity exists to achieve a solution due to emerging gas industry standards, advances in system technology, and a growing consensus as to the need to improve production data. That solution is best achieved through state/federal partnership.

We recommend that the U.S. Department of Energy (DOE) adopt this Conceptual Model as the basis of its State Upgrade Program, announced in *The 1993 Domestic Natural Gas and Oil Initiative.* In addition, we recommend that the producing states begin the process of upgrading state systems using the concepts embodied in the model. Finally, we recommend that industry be involved in each state's implementation to ensure that the most cost-effective components of the model are adopted.

Adoption of the Conceptual Model by producing states will provide the nation with vital production information in support of the new natural gas market. The nation's energy consumers will be the primary beneficiary through reduced price risk and increased use of domestically abundant, environmentally-benign natural gas.

ACKNOWLEDGMENTS

Primary funding for the Uniform Production Reporting Model project was provided to the University of Oklahoma by the U.S. Department of Energy under grant number DE-FG21-93MC30084, and by the Office of Governor David Walters of the State of Oklahoma under contract number SW-93-0701. Efforts to place the project and guide its scope were facilitated greatly by Clifford P. Tomaszewski and D. Denise Riggi at the Department of Energy, and by Charles Nesbitt, Michael Harris and Jeanie Robards for the Oklahoma Governor's Office. Mary K. Banken of the University of Oklahoma was the principal investigator for the project.

To complete a project of this size within such a short time frame required an intense commitment by talented project team members. Anne Mycek-Memoli and Joe Cusimano from the University of Oklahoma, and Brian Walker and Elisabeth Schmidt from Andersen Consulting, comprised the core technical team with primary responsibility for gathering and synthesizing a vast amount of information in order to design a Uniform Production Reporting Model and produce the Final Report. The daily cooperation and diligence of those four individuals was crucial to the overall success of the project. Charles J. Mankin, of the Oklahoma Geological Survey, and William C. Liedtke III, an independent energy consultant, provided invaluable input and guidance as technical advisors for the project. Graduate research assistance was provided by Lynn Francis and John Lembcke. Administrative support included significant efforts from Jennifer Veal, Terry Rizzuti, Ann Gray, Michelle Summers and Cheryl Patton. We gratefully acknowledge the skills and dedication of this entire team.

The Uniform Production Reporting Model was made viable through the inputs and reviews of numerous other individuals and organizations. The true architects of the Conceptual Model were the conservation, tax, and royalty agency representatives from the target states. Individuals from these agencies, too numerous to name but all crucial to the task, devoted many hours to assist the project team. Representatives from Oklahoma state agencies were particularly generous with their time and energies in this respect. Valuable guidance was provided by the Advisory Committee of State Regulatory Officials, including William Bryson (Kansas), Herbert Thompson (Louisiana), William J. LeMay (New Mexico), J. Michael Biddison (Ohio), Cody Graves (Oklahoma), David Garlick (Texas), and Don Basko (Wyoming). Significant input also was obtained from representatives from the Minerals Management Service, the Bureau of Land Management, and the Energy Information Administration.

The time, efforts and insights provided by numerous other individuals also were vital to the project. Through their participation in stakeholder groups, various individuals devoted many hours to working with the project team to develop a viable product. We are indebted to them for this assistance. These groups include:

- American Gas Association (AGA)
- American Petroleum Institute (API)

- Council of Petroleum Accountants Societies (COPAS)
- Edison Electric Institute
- Federal Energy Regulatory Commission (FERC)
- Federation of Tax Administrators
- Independent Petroleum Association of America (IPAA)
- Interstate Natural Gas Association of America (INGAA)
- Interstate Oil and Gas Compact Commission (IOGCC)
- Kansas/Oklahoma Division of the Mid-Continent Oil and Gas Association
- Mid-Continent Oil and Gas Association
- National Association of Royalty Owners (NARO)
- Natural Gas Supply Association (NGSA)
- National Association of Regulatory Utility Commissioners (NARUC)
- Oklahoma Commission on Marginally Producing Oil and Gas Wells
- Oklahoma Independent Petroleum Association (OIPA)
- REGS User Group - affiliated with the Revenue and Electronic Data Interchange Committees of the Council of Petroleum Accountants Societies (COPAS) and the American Petroleum Industry (API) Data Exchange (PIDX) Committee

The development of a viable Uniform Production Reporting Model required the time, expertise, and cooperation of these many individuals and groups from the public and private sectors. We acknowledge all of them with gratitude.

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INTRODUCTION AND BACKGROUND

General Trends

Natural Gas Can Realize its Potential as a Premier Energy Source. Natural gas is domestically abundant and is among the most environmentally benign of all the major sources of energy supply. The National Petroleum Council's 1992 analysis showed total resources of 1,295 trillion cubic feet (Tcf) that could provide gas well into the 21st century. Because natural gas is less environmentally harmful than other fossil fuels, it is the cornerstone of the federal government's Climate Change Action Plan, and an important tool in meeting Clean Air Act requirements. Natural gas utilization has increased in the last 6 years by 17 percent, and is expected to increase into the foreseeable future with a targeted utilization of 24 Tcf per year by the year 2010. New opportunities for natural gas utilization abound if government and industry can enhance supply reliability, including remediating concerns over the consistent availability of natural gas.

The Natural Gas Market Has Changed Quickly. The natural gas market has fundamentally and radically changed in recent years. Two events in particular affected all segments of the market: 1) The interstate pipeline industry was restructured in accordance with Federal Energy Regulatory Commission (FERC) Order 636. This Order has completely transformed the interstate natural gas pipeline industry, requiring that interstate companies separate their merchant and transportation functions. 2) The excess productive capacity that had plagued the gas industry since the mid-1980's has disappeared, leaving supply and demand essentially in balance. As a result of these developments, all segments of the industry are facing increased competition and greater risks associated with a market driven industry.

The New Market Requires Timely and Accurate Data. The continued deregulation and diversification of the natural gas market has created a dynamic environment in which producers, consumers, states, the federal government and the marketplace require timely and accurate data of higher quality than currently available. The quality of the natural gas production data will play a vital role in increasing gas deliverability and the development of an efficient national competitive market for natural gas.

Current Production Data Are Unacceptable. Precursor studies have demonstrated the lack of reliability of production data for national energy needs. The 1992 final report of the FERC/DOE Natural Gas Deliverability Task Force voiced a national need for improvements in production data as a necessary foundation for building dependable deliverability estimates.

The State Agencies That Collect and Supply These Data Are Finding That Task More Difficult. The conservation, royalty, and tax agencies of producing states have regulatory and revenue-collection roles that are based on production data collection.

These agencies increasingly are unable to provide timely and accurate production data due to:

- Out-dated information systems,
- Limited state resources, and
- Increased demands on those state resources due to the complexities of the new natural gas marketplace and fundamental shifts in the U.S. petroleum industry.

There is a Window of Opportunity For Improvement. Advances in information technology, the emergence of industry standards, and a growing consensus among all sectors regarding the need for improvement provide a unique opportunity for increasing the quality of the data available to the consumer.

The UPRM Project

The Uniform Production Reporting Model (UPRM) Project. The UPRM project was designed to develop a high-level conceptual model that would promote more uniform production reporting, and to assess the feasibility of applying that model across producing states. This high-level model, by definition, would be generalized and flexible enough to allow individual producing state adaptations within the framework of the model's overall principles.

Project Sponsors included the U.S. Department of Energy and the Office of the Governor for the State of Oklahoma.

The Project Team was led by the University of Oklahoma. The University brought in team members from Andersen Consulting to draw on their expertise in the design, estimation and development of large-scale systems.

The Project Began in July, 1993 and continued through early 1994. This aggressive timetable was necessary in order to generate a product that could be used during the formulation of the fiscal year 1995 federal budget.

National Benefits of Uniform Systems

Improved Data for Federal Policy Making will be available through upgraded state production reporting systems, and those data will be more timely and readily accessible nationally. Federal decision makers will be able to rely on more accurate state production data for addressing issues from tax policy to environmental policy and resource availability. Analysts will have more rapid access to those data, will be able to use the data more efficiently due to standard definitions and format consistencies, and will be in a better position to assess the data's completeness and accuracy.

Increased Federal Royalty Income will be possible for both public and Indian lands, as state production data can be used by the federal government for mineral valuation, audit and data verification purposes. Prior to FERC Order 636, some states estimated that 3 to 5 percent of natural gas was unreported or improperly valued. Those percentages are increasing to as much as 10 percent because gas market and industry changes are

occurring without parallel upgrades of state production reporting systems. Unless changes are made to develop more usable state data, the federal government and Indian tribes have the potential to lose $28 million per year in royalty income from federal onshore and Indian lands; the same rate of unreported production from federal offshore lands could mean an additional $130 million in potential royalty losses.

A Stronger, More Competitive Natural Gas Industry will result from a more timely and accurate information flow. As consumer confidence in supplies of natural gas increases, the demand for natural gas will expand. The resulting increased revenues will strengthen the natural gas industry, providing:

- increased employment in high-tech, high paying jobs;
- increased investment in research and development;
- development of domestic energy resources into reserves; and
- increased state and federal revenues.

Efficiencies in Gas Markets Costs will be achieved through new state reporting systems that are consonant with modern industry systems, FERC-mandated Electronic Bulletin Boards (EBB), and Electronic Data Interchange (EDI) standards. EBB working groups were formed and supervised by the FERC to identify and derive consensus for electronic standards that are intended to make transportation of natural gas by regulated entities more reliable and market efficient. In a similar manner, more uniform state production reporting systems, advanced by the federal government to improve data, will lead to better decisions about production levels by natural gas producers, will remove informational barriers that impede the actions of the competitive market, and will reduce economic inefficiency and misallocation of resources.

Energy Consumer Interests will be protected through the availability of more timely and reliable production data. Public utilities and other energy consumers will have access to the information they need for more accurate and economically efficient supply planning. State utility regulatory commissions will be greatly assisted by better supply data. The operation of the gas futures market will be enhanced by a reliance on dependable supply information rather than on outdated or anecdotal information; the result will be a reduction in the short-term price volatility that is caused by uncertainties in gas supply and deliverability. When a one to three cent per mcf increase results in consumer costs of $180-$540 million per year, it is imperative that all increases are well-founded.

Producing-State Benefits of Uniform Systems

Better Control of State Resources will be available to state regulatory agencies through upgraded state production systems. Reliable production and supply information is crucial to producing states as they seek to efficiently manage their gas and oil resources. Timely and accurate data will help ensure that all volumes are reported and that state royalty and tax revenues are collected properly; in some states this improvement could increase annual revenues by millions of dollars. The new systems will accommodate the changes in the petroleum industry, including the fundamental changes within the natural gas market, and will include enhanced data quality processes and inter-agency data sharing that will allow the states to more easily monitor and estimate their revenues and resources related to gas and oil production.

Increased State Agency Efficiencies will be natural by-products of upgraded data processing systems. New data processing systems typically include a re-engineering of current business processes, both automated and manual, to allow those business processes to be performed more systematically with fewer personnel resources. Through modern technologies, state agencies' ongoing computing costs can be reduced. By increasing the use of electronic communication and automated information processing, the productivity of agency personnel can be enhanced. Modernized systems will enable states to efficiently provide timely, accurate, consistent and accessible production data to state and federal policy makers and to energy consumers.

PURPOSE

Project Goals. The primary goal of this project was to identify and document the best policies and procedures for the effective collection, management, and dissemination of natural gas and crude oil production data. These best policies and procedures were to be documented in the form of a high-level design called the Conceptual Model. Estimated implementation requirements were included as a component of the overall feasibility of the adoption of this Conceptual Model by producing states.

Objectives of the Conceptual Model. All recommendations contained in the Conceptual Model are designed to achieve improvements in the overall quality and availability of production data in one or more of the following aspects:

- Timeliness
- Accuracy
- Consistency
- Accessibility

Project Guiding Principles. The UPRM project established guiding principles to provide a general framework for the development of the Conceptual Model. The primary Guiding Principles include:

- The state is the primary government entity and owner of the data for non-federal lands. Federal data collection would remain restricted to the current limits of federal onshore and offshore lands by the Minerals Management Service and the Bureau of Land Management.
- The model must be flexible enough to accommodate state-specific requirements.
- The implementation of the model should be predicated on federal incentives to states, not mandates.
- The model must utilize the best existing and emerging data and communication standards.
- The model must provide for cross-agency and interstate sharing of data, and cross-agency verification of information.

Focus on Production of Commercial Hydrocarbons. The scope of the UPRM was limited to data regarding the production of commercial hydrocarbons. Since most states consolidate the reporting of gas and oil, liquid hydrocarbons were included in the model. The UPRM specifically excludes consideration of non-salable and non-hydrocarbon products such as water. It also excludes the transportation, storage and consumption elements of the deliverability chain, though it does provide for an interface to that chain. This narrow definition of scope was imperative to ensure that the resulting guidelines were sufficiently focused to provide the most value for future systems.

METHODOLOGY

Primary Sources of Input. The Conceptual Model is a repository of the best policies and procedures for the gathering, management, and dissemination of production information. Expert input into the development of this repository was provided by a diverse group of stakeholders. Representatives from producing-state conservation, tax and royalty agencies were viewed as the true architects of the conceptual model. In most states, these three agencies have responsibilities that include the collection of production data. Conservation agencies oversee all state regulatory functions in the life cycle of gas and oil wells; tax agencies are responsible for revenues from taxes on volumes sold; and royalty agencies collect and monitor gas and oil royalty income from public lands. The largest gas producing states specifically were targeted during the data collection process. The model's development was guided through an Advisory Committee of State Regulatory Officials, with representatives from Kansas, Louisiana, New Mexico, Ohio, Oklahoma, Texas and Wyoming, as well as federal representation from the Minerals Management Service, the Bureau of Land Management and the Energy Information Administration. Significant input also was obtained from industry reporters and users of production data, primarily through contacts with various industry associations.

Approach Summary. The basic approach to developing the Uniform Production Reporting Model involved the following major steps:

- Current state and federal (MMS, BLM) production data systems and procedures were reviewed and analyzed. Published gas and oil information provided a foundation for this review. For the target states, more detailed information was gathered through mailed questionnaires, teleconference calls, and site visits.
- Based on the preliminary input from state agencies, an initial ("straw man") model was developed as a compilation of the most effective identified procedures.
- The preliminary model was reviewed and refined through a series of meetings with the state, industry and federal experts. The resulting final Conceptual Model is a viable product that is generally accepted by the various sectors involved with production data.
- An approximation was developed of the labor and technology requirements to implement the UPRM. To do this, an estimate was developed for one hypothetical state implementation, and that estimate was extrapolated to the remaining states based on a measure of the amount of gas and oil activity in those states. This approximation method provides a reasonable high-level estimate of the potential costs of a UPRM implementation in various producing states.

RESULTS AND DISCUSSION

Findings

There is a Necessity for Change at the State Level. The state conservation, tax and royalty agencies that normally are responsible for gathering and distributing production data are increasingly unable to do so. The major causes of this situation include:

- Fundamental changes in the natural gas market and the domestic industry have changed the make-up of the data reporters to the state agencies, and the new data reporters are not as well equipped to fulfill their reporting requirements.
- Current production reporting systems were developed by the separate state agencies in isolation from one another, and so the standardization and data links required for inter-agency data sharing do not exist.
- Aging state information systems are suffering from out-dated technologies, and have been "patched" to the point of disrepair.

There is Support For Change Within Industry. Given the continued pressure on the domestic petroleum industry, lowered administrative costs would benefit the industry as well as the consumer. Specifically, many industry members would like to eliminate duplicative reporting of information to multiple agencies within a state, and eliminate unnecessary variations in reporting requirements to different states. In addition, operators are increasingly dependent upon publicly-available production information in the management of their daily operations. A more efficient flow of production and supply data would benefit the petroleum industry and state agencies through increased revenue, and the consumer through the lower cost of gas.

Change is Possible With Federal Assistance. Most guidelines presented in the Conceptual Model are already being utilized in one or more producing states; however, most states will require significant changes in order to have a system that is completely consistent with the proposed Conceptual Model. While it is possible that no state will adopt 100% of the guidelines, many are capable of adopting most of the guidelines; the State of New Mexico's recent efforts provide an example of this potential. The true benefits of the UPRM can be gained only through a multi-state implementation. Although some states may choose to adopt the UPRM unilaterally, federal assistance will be required for a broad-based acceptance and implementation of the UPRM and for the benefits of this implementation to be available to national consumers and the gas market generally.

The Conceptual Model

The ***UPRM Conceptual Model*** is a high-level design of an idealized production processing system for adoption at the state level. The model begins with a generalized description of each of the production-related business events that require regulatory oversight during the life of a typical well. For each business event, a generalized flow diagram highlights the specific system functions, conceptual data stores, and entities involved in the process. Furthermore, within each business event specific opportunities have been identified for developing greater data uniformity; these opportunities have been compiled into a "checklist" of sixty Uniformity Guidelines. The Uniformity Guidelines are the key component of the Conceptual Model, as these are the specific UPRM recommendations for promoting uniformity of production data. The guidelines were classified into five groups:

- ***Reference and Relationship*** guidelines address data identification and linkages (e.g., the use of an API well bore number and the linking of wells to tax groups).
- ***Timing and Content*** guidelines focus on the flows of data into and out of state agencies (e.g., specifying reporting due dates and required data elements).
- ***Communication*** guidelines specify the use of existing telecommunications standards.
- ***Validation and Verification*** guidelines specify steps to be taken to assure data accuracy (e.g., cross-agency data checks).
- ***External Data Sharing*** guidelines provide consistent access methods for data users across producing states.

These guidelines have evolved through numerous discussions with state and industry stakeholders, and each guideline is addressed in detail within the Conceptual Model. They are designed to meet the four objectives set out for the Conceptual Model: **data timeliness, accuracy, consistency, and accessibility**.

Implementation

Requirements. A high-level approximation of implementation requirements was developed to give the DOE an understanding of the basic financial parameters of a state upgrade program. This approximation should be viewed as a "first cut" to identify potential system development and conversions costs for states, based on the relative size of the gas and oil reporting activity within each state. A more definitive cost estimate was not possible within the scope of this project because of the degree to which actual costs will depend on decisions that will be made by individual states. The actual costs will vary from this approximation because:

- Some states have already adopted many of the UPRM concepts, or will adopt only a subset of the concepts.
- Some states could develop joint projects to achieve system development efficiencies.

- The approaches taken by some states will vary from the basic assumptions used to approximate costs (e.g., the mix of state and external labor).

As the state upgrade program proceeds into the next phase, several states should be selected to develop detailed system designs for their agencies, and cost estimates for those designs. These cost estimates will provide an indication of the overall costs for extended implementations of the model. For example, assume that two pilot states are identified for detailed design activities. According to the assumptions made in this implementation model, the total cost for a "Tier 2" and a "Tier 5" state would be approximately $32 million dollars, which with a 50/50 cost sharing ratio would be about $16 million in federal dollars. Cost estimates that will be developed by the pilot states can be compared to this approximation, validating and/or refining the estimates and assumptions.

Regardless of the degree to which actual costs will match the estimates within this model, implementation costs will be significant. Evidence of these costs is provided by the current efforts of the State of New Mexico to develop a new processing system for all of their gas and oil reporting activities. Since the New Mexico system includes functions that are not addressed within the UPRM, a strict cost comparison is not possible; however, it is informative to note that New Mexico has invested approximately $18 million to develop a system to accomplish most of the UPRM goals. In New Mexico, and in most states, the expected returns on the investment will be more than offset by the expected benefits, with expected gains of millions of dollars per year in state revenues.

Time frame. No specific time frame has been recommended; however, the DOE has indicated that it is interested in beginning the implementation of its State Upgrade Program in fiscal year 1995.

Recommendations

The UPRM Should be Used as the Basis for The U.S. Department of Energy's (DOE) State Upgrade Program. The DOE now can take advantage of the significant input received in the development of the Conceptual Model, and look toward implementing the model through state assistance as outlined in the *1993 Domestic Natural Gas and Oil Initiative,* Action 3.1 Upgrade State Data Collection and Reporting on Natural Gas Production.

A State/Federal Partnership Should be Established to Ensure the Long Term Success of the UPRM. Producing states and the federal government should develop partnerships in which both agree to work together to refine and implement the concepts presented by the UPRM.

A UPRM Implementation Program Should Begin in Producing States. Producing states should begin assessing their current situations to determine if they wish to participate in the DOE state assistance program, and how to begin the UPRM implementation process.

CONCLUSION

Nationwide Implementation is Feasible

The original project charge was to investigate the feasibility of developing a conceptual model for nationwide use in gathering, managing and disseminating production data. Such an implementation is indeed possible, and many states are interested in adopting the guidelines outlined by the UPRM Conceptual Model. At the same time, the increasing budgetary pressures within states limit their ability to respond. For that reason, federal assistance to producing states will be *essential* for wide-spread adoption of the UPRM or any uniform and usable system of data gathering.

Implementation is Urgent

A window of opportunity for natural gas to become a premier energy source in the United States is present today, but without decisive action, that window could close. The primary barrier to widespread use of natural gas is its perceived lack of supply reliability. This problem is due primarily to the lack of timely and accurate production and deliverability information for supply planning purposes. Inadequate deliverability data and inadequate supply information can cause artificial price volatility; this can negatively impact producers' decisions to drill and to further expand the nation's resources into productive reserves. Since reserve increases will come only through increased drilling, the wide-spread implementation of a uniform production reporting system such as the UPRM improves resource supply planning, which increases opportunities for new drilling. Patchwork revamping of state systems may deplete available state funds without providing national benefits.

Benefits of Implementation

The ultimate beneficiary of improved production data is the consumer. Benefits will accrue through reduced price risk and assured availability of domestically abundant and environmentally benign natural gas. Producing states will benefit from the adoption of the UPRM through better control over gas and oil resources and cross-agency sharing of data. The federal government will benefit from improved data for policy making and from increased royalties for managing public and Indian lands.

The nation will benefit from a stronger, more competitive gas industry. As consumer confidence grows, the demand for natural gas will increase, and the natural gas industry will expand. This will result in increased employment, increased research and development investments, increased conversion of the nation's domestic resources into productive reserves, and an overall positive impact on the nation's economy.

The Conceptual Model is Only the First Step

The UPRM is only the first step in the process of realizing the benefits of nationally uniform production data. It is now up to the state and federal governments to capitalize on the extensive knowledge captured through this effort. The UPRM initiative has required the close cooperation of representatives from state governments, industry, and the federal government. This cooperation will be essential for the long term success of the UPRM. The DOE can assure this success by adopting the UPRM as the basis of its State Upgrade Program, introduced in *The 1993 Domestic Natural Gas and Oil Initiative*, Action 3.1 Upgrade State Data Collection and Reporting on Natural Gas Production.

II. INTRODUCTION AND BACKGROUND

INTRODUCTION

Natural gas has the opportunity to become one of the premier fuels for the United States. It is domestically abundant and will remain a critical component of energy supply in our nation for the foreseeable future. The National Petroleum Council completed an analysis in 1992 that showed total resources of 1295 trillion cubic feet (Tcf). These resources could provide gas at our present rate of consumption well into the 21st century (68 years).

The use of natural gas also is less environmentally harmful than the use of other fossil fuels. In many applications, natural gas can be used to reduce the emissions of SO2, CO2, particulate, and can sometimes be used to reduce NOx emissions. For this reason, natural gas is the cornerstone of the federal government's Climate Change Action Plan, and an important tool in meeting Clean Air Act requirements.

Natural gas utilization has increased in the last 6 years by 17 percent and is expected to increase into the foreseeable future. The Department of Energy has targeted the utilization of natural gas to reach 24 Tcf by the year 2010. New opportunities for natural gas utilization abound, assuming the natural gas industry can remediate impediments to supply reliability. The concern over the consistent availability of natural gas is a principal impediment to increasing market penetration by natural gas for electric power generation and utilities.

One of the key causes of the perceived questionable reliability is the unavailability of timely and accurate supply information. A critical component of supply planning is the projection of deliverability, an estimate of future available production that is normally calculated using historical production information. Reliable, consistent and timely production information is not available on the national basis that would allow for reliable national deliverability calculations.

The changes in the natural gas market in recent years have been both fundamental and dramatic. Two events in particular affected all segments of the market: 1) The interstate pipeline industry was restructured in accordance with Federal Energy Regulatory Commission (FERC) Order 636. This Order has completely transformed the interstate natural gas pipeline industry, requiring that interstate companies separate their merchant and transportation functions. 2) The excess productive capacity that had plagued the gas industry since the mid-1980's has disappeared, leaving supply and demand essentially in balance. As a result of these developments, all segments of the industry are facing increased competition and greater risks associated with a market driven industry. In this dynamic environment, timely and accurate data are crucial for the proper functioning of the market.

This report highlights the opportunities made available by significant improvements in modern data system technology and ongoing industry and government standardization efforts. Cooperative efforts by state and federal agencies in upgrading production data collection

processes can better protect the nation's natural gas consumers, better serve the nation's energy producers, and reduce costs for the government and private sectors who provide natural gas and oil production information.

Precursor Study - the FERC/DOE Deliverability Task Force

This project, the development of a Uniform Production Reporting Model (UPRM), was undertaken to meet increasing demands for more timely and accurate gas and oil production information. Specifically, the UPRM project was initiated in direct response to recommendations made by the joint Federal Energy Regulatory Commission (FERC) and U.S. Department of Energy (DOE) Natural Gas Deliverability Task Force in their Report which was published in September, 1992. That task force specifically recommended improving natural gas deliverability data -- including examining "...the propriety and feasibility of developing a standard reporting regime for production data." The Deliverability Task Force Report, on page 1, further concluded that:

- *The ultimate success of the evolving competitive natural gas market depends largely on the quality of signals exchanged by the participants. Without good information on deliverability, those signals can be only partially accurate. In addition, without timely deliverability data, business and government leaders could make flawed decisions based on unreliable information, resulting in skewed economic consequences.*

- *Information on natural gas today is often fragmentary, late, and focused on outdated issues. Redesigning data systems to serve the emerging, competitive natural gas industry is a crucial challenge for the next decade. The information infrastructure that now serves the natural gas industry was built for the industry of the 1950s, 1960s, and 1970s. Vast changes in the world energy markets, along with the recent overhaul of regulatory theory and practice, have instigated relatively swift changes in market roles and structures.*

The Uniform Production Reporting Model (UPRM) Project

Two National Problems

Building on the work of the Deliverability Task Force, the UPRM project has focused on two distinct problems with national production data:

First: Dramatic changes in the natural gas market have increased the national need for reliable production data.

Second: The data gathering systems of the producing states have been overwhelmed by the changes in the natural gas market and do not provide reliable production data.

Ironically, as the ability to gather and manage production data has decreased, the national need to use and rely upon that data has grown.

Common Solution

Both problems can be addressed with a shared solution: a state/federal partnership to implement a uniform production reporting system. Importantly, the development of a uniform system cannot be accomplished by an isolated state or even by the federal government on its own; close cooperation must occur among states, industry and federal agencies. To that end, the UPRM provides a high-level model from which policy makers can go forward.

Project Focus

The primary focus of the UPRM project is on improving the quality and accessibility of production-related data for the users of those data. This focus requires, by extension, a close examination of the processes and procedures used to capture and process, as well as share basic production data.

Although one of the original catalysts for beginning the UPRM project centered on natural gas deliverability, the UPRM is not a method or model to ascertain natural gas deliverability or productive capacity. The UPRM is focused solely on developing a high-level model to improve and encourage uniformity in gas and oil production data and the data gathering processes. A useful byproduct of the implementation of UPRM concepts will be more accurate and consistent production data that are necessary to model either the deliverability or productive capacity of wells, reservoirs, fields or regions.

Because of the inherent efficiencies of a common system, data for both gas and oil production are addressed by the UPRM. Many of the policy imperatives behind this project, however, apply only to gas production since the oil industry has not taken on the complex characteristics of the gas industry.

The UPRM initiative seeks to achieve a balance between the goal of supplying ideal data and containing the costs associated with providing data of that quality. While the market may benefit from information that is extremely current and accurate, the states and industry operate under economic and practical constraints that may dictate a solution that is somewhat less than the ideal. Changeover costs for both the states and the reporting industries must be recognized. Therefore, this effort seeks:

- to identify specific recommendations for improving the timeliness and accuracy of data,
- to outline the public sector costs associated with realizing these improvements, and
- to highlight the benefits of a uniform gas and oil production reporting system.

CURRENT ENVIRONMENT AND GENERAL TRENDS

Changes in the Natural Gas Market

For the past several decades, broad and continuing changes have been occurring in the natural gas market, driven partly by natural market forces and partly by government actions. These changes have intensified in recent years, resulting in a fundamentally different market structure. While a complete description of the evolution of the natural gas industry is beyond the scope of this document, a general understanding of the shift in the roles and responsibilities of industry participants helps to illuminate the public need for an upgraded and uniform system of reporting production.

Previous Market Structure

Historically, natural gas industry trading arrangements were relatively static. Producers typically "dedicated" a well to a pipeline on a long-term basis; the pipeline purchased, transported and re-sold to a closely defined group of customers, usually the Local Distribution Companies (LDC's; i.e., gas utility companies) for which the pipeline had a regulatory obligation to service. The interstate pipelines served as regulated near-monopolies in the transportation of gas and, except for "split-connected" wells, typically did not compete materially with each other on a short term basis. Gas contracts were in effect for as long as 10 or 20 years, and gas was not re-traded on any kind of periodic basis.

On the heels of gas and oil price escalation in the late 1970's (due in large part to OPEC action and to perceived gas and oil shortages), producers responded to market signals and government incentives by increasing exploration, development, and production. This activity resulted in an expanded international oil supply and a precipitous fall in the price of hydrocarbons. Coupled with the impacts of the Power Plant and Industrial Fuel Use Act of 1978, and the Natural Gas Policy Act of 1978, these developments led to the advent of the popularly described natural gas oversupply "bubble." Because of regulatory constraints, LDC gas sales were on a "weighted average cost of gas" basis which prevented selective resale price reductions to customers who chose to either conserve or switch to competing fuels. Caught by the inflexibility of the pricing structure, the natural gas industry began to lose customers and gas volume throughput.

Market Restructuring of FERC Orders

Because of price inefficiencies within the gas industry and its loss of market share to competing fuels in the early 1980's, the FERC began a series of regulatory initiatives capped by Order 636 which dramatically restructured the natural gas market. Competitive market forces were allowed to come into play in sectors of the industry that previously had been shielded. Contract terms of one month became the norm as buyers and sellers, unwilling to risk long term contracts with pricing that might not reflect changing conditions, adopted a contracting methodology that allowed them to assume price risk for shorter periods of time. As a result, the number of market players and contracts has expanded substantially as these new marketers compete each month to buy gas from producers or resell to industrial gas users and LDC's. Purchasers now buy from a variety of sellers, whose identities may change each month, and producer/sellers find themselves doing business with an equally expanded array of potential purchasers. This highly dynamic interrelationship of parties is in marked contrast to the static relationships of the previous market.

Regulated interstate pipeline companies have been transformed from merchant buyer/resellers of gas into contract carriage transporters. Thus the purchaser and shipper of natural gas often differ from the entity that is measuring, gathering and transporting the gas from field to market. Not uncommonly, the buyer in a given transaction might not have physical facilities in the state in which a wellhead gas sale is being made.

The previous formal structure of the gas industry has evolved into a far more complex and dynamic situation. As the market has become more competitive and diffused, the identification of parties responsible for filing and collecting data has become more difficult. Information is no longer collected and verified by industry participants to the same degree as before. State reporting requirements and procedures predicated on past market structure have begun to show strain.

The Natural Gas Futures Market

The advent of gas futures trading on the NYMEX significantly has changed the pricing and market for natural gas. Futures trading has increasingly "commoditized" gas. The quoted futures prices during the last three days of trading for the next calendar month tend to set the cash prices for gas, even though the futures prices otherwise are not accurate predictors of cash prices. Prices change on the futures market based on anticipated changes in demand for gas coupled with an ongoing assessment of deliverability and production information. Because cash markets ultimately follow the futures market, inaccurate or unavailable production data have the potential to materially affect the price actually paid for gas by consumers.

The Market Impact on Utilities

With the advent of FERC Order 636, the purchase and resale of natural gas in interstate commerce essentially have been deregulated. However, approximately half of the natural gas distribution to consumers remains regulated through state Public Utility Commissions, and the regulated utilities face significant new challenges as their purchasing responsibilities are changing. Both the regulated utilities and their regulating commissions need access to reliable information on both the volumes and values of natural gas, and they can no longer depend on pipeline companies to provide that information. It is in the best interests of the nation's utility consumers to have such information available in a timely and consistent manner from each of the producing states.

The Challenge of Reliable Production Information

The developing structure of the current gas market has dramatically heightened the need for dependable information. In its evaluation of the evolution of the natural gas market, the Deliverability Task Force Report noted that:

- *Information will be the life-blood of emerging and rapidly changing competitive gas markets. In such an environment, parties currently have little experience on which to base their decisions. They will depend far more on information sources than do many participants in older markets.* (Deliverability Task Force Report, page 1)

Information about the quality, quantity and value of gas always has been desirable for ensuring an orderly market. The hallmark of the new gas market and the accompanying regulatory proceedings has been the increased focus on the importance of information. One example of this focus is provided by the FERC mandates and industry work groups on Electronic Bulletin Boards (EBBs) for transportation information. Additional evidence is seen through FERC Order 636's "unbundling of services" which includes restrictions on the preferential sharing of information between pipeline and marketing affiliates.

The effect that changes in the structure of the natural gas market are having on production data quality, collection, and usage can be illustrated by a few examples, given in the respective contexts of the producing, transporting and consuming sectors of the gas industry.

Production Sector

The sheer increase in purchasers of gas production, the month-to-month changes in purchaser identity and gas volumes purchased, and the post-production month data adjustments are aspects of the new gas market that are challenging state production data systems.

Multiplicity of Purchasers. In most of the nation's natural gas wells, individual producer/owners (or "working interest owners") retain the right to separately market their own production. In many wells, these owners have remained content to let the well operator market on behalf of all owners in the well. However, in a substantial number of wells the individual working interest owners market their gas production to their own separately-designated gas purchaser. Several different buyers now purchase volumes of gas from a given well in any given month.

In producing states where "first purchasers" of production are assigned the duty of filing production information with appropriate state agencies, the number of filing parties has increased, the likelihood of partial filing or non-reporting has increased, and the difficulty of detecting non-reported gas production data has increased.

Change in the Nature of Well Operators. In addition to the impacts of the identified market changes, two industry trends have impacted the quality of reporting from well operators to state agencies. First, staff reductions in many gas and oil companies, large and small, have limited the ability of these companies to devote scarce personnel resources to monitor reporting problems. Second, larger exploration and production companies have sold a substantial number of domestic onshore properties to smaller companies during the last decade. Commonly these smaller companies do not have the staffing or experience to manage all of the multiple reporting requirements on well operators.

States must now depend on well operators that might be less prepared to reliably fulfill their reporting requirements than in the past. Because a higher proportion of the wells are being reported by smaller operators, more state agency staff resources are required to assist operators and resolve reporting errors.

Change of Purchasers and Percentage of Volume. Because gas sales contracts of brief duration are now common in a competitive market, working interest owners can switch purchasers frequently, depending on the best price offered to them. For example, a gas purchaser who bought in March might not have reportable transactions in April or May, or might have bought from a different mix of owners in the well and therefore be reporting a different percentage of the well flow.

Many state production reporting systems link all first purchasers to wells and require them to file "zero volume" reports for non-purchase months; these systems have become inundated with useless data. Data verification procedures based on historical purchaser percentages are obsolete.

Post-Production Month Adjustment of Data. Purchasers or shippers nominate expected volumes prior to the beginning of a month. The transporters confirm those volumes and notify the well operator of the gas to deliver. Since natural gas production is not engineered to easily attain close volume tolerances, variances

between expected and actual volumes require extensive after-the-fact corrections. After the month of production, the nominated volumes must be adjusted to reflect actual volumes of gas produced and transported. Those adjustments must then be allocated to the sellers and buyers. This post-production month adjustment process is iterative in nature, often requiring 4-6 months before the data stabilize. Post-production month accounting adjustments have become an accepted and expected aspect of doing business in the current natural gas market.

Producing state agencies are seeing post-production adjustments to gas data increase to nearly 40% of the lines of data reported in any given period. Older systems were not designed for this aspect of the natural gas market, and burden short-handed state agencies with additional manual validation duties.

Transportation Sector

The pipeline and marketing sectors of the gas industry also have undergone substantive changes which have affected their ability to report and their need to use natural gas production data.

Filing and Accounting Requirements. Pipelines and gatherers, as "first measurers" of gas production, commonly are required to file gas production volume information with state agencies. Merchants and marketers as "first purchasers" commonly are the filing parties for value and related volume data. As the sheer volume of separate reportable events has increased, so have the cost and effort required by industry to file their information in non-standard formats to a variety of state agencies. Just as the producing state agencies face the difficulties of post-production month adjustments and the sheer number of reportable items, the transportation industry has been similarly affected.

First purchasers and first measurers of production have to meet competing and often conflicting reporting requirements, standards, unique numbering systems, and methodologies. The high cost of maintaining private sector data processing systems to interface with disparate reporting requirements is economically inefficient.

Pipeline Management Data. When interstate pipelines were merchants of gas, they kept and analyzed production data for wells near their systems. When they relinquished their role as merchants, they lost the ability to collect and maintain that information. Today, the pipeline industry could see a growing dependence on state production and related data when making decisions about the need for new or upgraded facilities, or about the management of current facilities. Reliable regional production data are required for management decisions such as offering selective discounting to retain transportation load in the face of competition.

Current state data are not usable for pipeline management decisions in many producing states. The required information is not present, or is not accessible in a format that can be readily manipulated for analyses.

Consumption Sector

Some of the major changes in the natural gas market production information flow have their greatest potential for substantive economic impact on the nation's consuming sector.

LDC Supply Aggregation Responsibility. A product of FERC Order 636 is a shift in responsibility from the interstate pipelines to the LDC's of the duty of aggregating gas supply in a cost-effective manner. This major shift in role for the LDC's requires that they have access to accurate supply and production data in the states and geological basins from which they can obtain their gas. Unlike the interstate pipelines in their previous role, the LDC's typically do not have employees or facilities in the producing regions, direct reserve or production data gathering capability, or an historical perspective on how to go about the task of evaluating gas production.

Producing state records are not currently in a condition to be useful to LDC's in this new duty, yet these consuming state gas utilities must find a cost effective method to accumulate these data. LDC's need ready access to gas volume and value data in order to plan for near and intermediate term supply needs. They also need to rely on these data for both prospective-approval proceedings and after-the-fact prudency reviews with their overseeing Public Utility Commissions.

Difficulty of Deliverability Estimation in a Deregulated Market. Too many variables go into the computation of overall national natural gas peak-day deliverability for it to be calculated with any true degree of certainty. Nonetheless, national and regional deliverability estimates and scenarios need to be modeled for peak-day contingency planning and the protection of consumers. In the old gas market, gas tended to be captive to a particular interstate pipeline, and deliverability planning for the benefit of that pipeline's customers of that pipeline was an engineering exercise that took into account such variables as anticipated demand, supply disruptions, frozen wellhead equipment, and pipeline pressures.

In today's highly interconnected pipeline grid, where gas can "wash" from pipeline to pipeline in response to market price signal, the universe of relevant production data is not only much broader, but the information itself currently is more diffusely held. More information is needed today to forecast deliverability, yet less data are available.

Production data in an accurate and easily manipulated format are essential to model deliverability and make contingency planning on behalf of the nation's consumers. The Energy Information Administration (EIA) and private sector analysts need this information from producing state agencies in a more timely, accurate, accessible and standard format than is available today.

Government/Industry Move toward Standardization

The issue of emerging consensus on national standards deserves special mention. As the natural gas market and the associated information flows have become increasingly more complex, industry and government have joined forces to institute and encourage standards in information flow. Notable among these efforts are:

1. The multi-industry task force that developed the Interstate Natural Gas Association of America (INGAA)/Council of Petroleum Accountants Societies (COPAS) Bulletin #28;
2. The FERC Electronic Bulletin Board (EBB) proceedings and its five industry working groups;
3. The proposed Gas Industry Standards Board (GISB); and
4. The REGS User Group affiliated with the COPAS Revenue and Electronic Data Interchange (EDI) Committee and the American Petroleum Institute (API) Data Exchange (PIDX) Committee.

To the extent that new state systems incorporate these standards, not only do all parties realize the benefits of information standardization, the state action may generate a broader acceptance of these standards. Conversely, if producing states implement new production reporting systems on their own that do not incorporate these proposed standards, the implementation of non-standard state systems may impede the development and acceptance of gas industry standards.

PROJECT INITIATION

Although the UPRM project did not deal directly with natural gas deliverability, its genesis lay in the recommendations of the joint FERC/DOE Natural Gas Deliverability Task Force. Their report demonstrated and voiced a national need for reliable production data as a necessary foundation for building dependable deliverability estimations.

In March 1990, the FERC and the DOE began working together on the Deliverability Task Force. Their primary objectives included assessing the accuracy and utility of available deliverability information; recommending initiatives at the state and federal levels to increase the credibility and timeliness of information being used to measure deliverability; and encouraging the development of accurate, reliable, and timely deliverability information.

The Natural Gas Deliverability Task Force addressed deliverability data through a case study of Oklahoma gas production data for December 1989 and found substantial problems in the quality of that data. In their final report (September, 1992, page 4), they included the following specific recommendations related to production data reporting (emphases added):

- *The Interstate Oil and Gas Compact Commission (IOGCC) should work with the Energy Information Administration (EIA), Department of the Interior (DOI) [Minerals Management Service (MMS), and the Bureau of Land Management (BLM)], and the producing states* ***to examine the propriety and feasibility of developing a standard reporting regime for production data.***

- ***DOE should consider the propriety of co-funding the development and installation of hardware and software in those states which are willing to participate in a cooperative effort to standardize the electronic reporting of gas production and deliverability data on a real-time basis to EIA.***

In direct response to those recommendations, the University of Oklahoma (OU) approached both the U.S. Department of Energy (DOE) and the Office of the Governor of the State of Oklahoma to take on the work associated with the investigation and development of a model for uniform production reporting. Both DOE and the Oklahoma Governor's Office agreed to provide funding for the UPRM project. In building its project team, OU contracted with Andersen Consulting to assist in the effort, drawing on Andersen's extensive experience in the design, estimation and development of large-scale systems.

The project officially began in July, 1993 and continued through early 1994. This aggressive timetable was set in order to produce a document that would be usable during the formulation of the FY95 federal budget. The project team was tasked with identifying opportunities for improving the timeliness, accuracy, consistency and accessibility of production-related information, and assessing the feasibility of those improvements.

ANTICIPATED BENEFITS

National Benefits

The anticipated national benefits of adopting a uniform system for production reporting fall into five general categories:

- Improved data for federal policy making
- Increased federal royalty income
- A stronger, more competitive natural gas industry
- Gas market cost efficiencies
- Energy Consumer Interests

Improved Data for Federal Policy Making

Timely and accurate production information is crucial to policy analysts and decision makers. A variety of federal policy makers could utilize the improved information from producing state agencies.

DOE/EIA Analyses and Reports. The EIA uses state data as a basis for responding to information requests and for analytical reports on gas production, deliverability and reserves. If high quality state information was readily available, EIA's effectiveness would be enhanced in its support of DOE and national policy-makers.

FERC Access to State Production Records. Since interstate pipelines are no longer the collectors of supply data, the FERC will need access to new sources of production and related data: the individual state agencies. This information will be crucial to FERC as it evaluates new pipeline facilities construction, long term pricing and supply trends, and pipeline rate-making methodologies.

The FERC has limited jurisdiction over, and consequently limited information about, the flow of gas in purely intrastate transactions. Some of the largest markets for natural gas in the United States are in fact intrastate, and the relationship of supply and demand in those markets has an enormous effect on the interstate markets. To the extent that the FERC has better access to information concerning those intrastate markets, it will be better prepared to protect the interest of consumers.

Congressional Analysis. As Congress evaluates the advisability of various policies for the domestic gas and oil industry, it could take advantage of uniform production

data to project impacts or to monitor the actual effect of any policy initiative. For example, incentives programs for marginally-producing gas and oil wells are the subject of numerous initiatives at both the state and federal level. Analyses of both the expected and the actual impacts of these various proposals requires the kind of data that will be available through a UPRM implementation.

Other Federal Agencies. Given the data collection responsibilities for federal lands, the Minerals Management Service and the Bureau of Land Management stand to directly gain from a move toward uniform production reporting. In addition, uniform state production information would be beneficial to other agencies that have special needs for particular data. The Federal Energy Management Agency (FEMA), the Department of Defense (DOD), the Environmental Protection Agency (EPA), and other federal agencies could benefit from access to such data.

Increased Federal Royalty Income

Public and Indian lands are the largest sources of natural gas supply in the U.S. market. The federal government has the management responsibility to receive proper value for minerals produced from public and Indian lands with a special fiduciary responsibility for Indian lands. Historically, the Minerals Management Service obtained data from pipelines to determine values for royalty purposes, and to provide an external data source for audits and data verification. With the issuance of FERC Order 636, the only source of comprehensive information will be the producing states. To insure that minerals produced from public and Indian lands are valued properly, accurate and timely information in a standard format will be needed by the federal government from each of the producing states.

Royalty income to the federal government from federal onshore and Indian leases in 1992 was nearly $280 million, with an additional $1.3 billion in federal offshore royalties. A one percent reduction in royalty evaluation would cost the federal government and Indian tribes $2.8 million per year for onshore properties alone. Prior to the issuance of FERC Order 636, estimates from some states indicated that as much as 3 to 5 percent of natural gas was unreported and/or improperly valued. Under FERC Order 636, without state upgrades of production reporting and accounting systems, the percentages of unreported and improperly valued gas are increasing; some estimate this under reporting is reaching 10 percent. Therefore, in the absence of accurate and timely state data, the federal government and Indian tribes are potentially losing as much as $28 million per year in natural gas royalty income from onshore leases; if the same rate of unreported production applies, losses from federal offshore leases would be an additional $130 million. Most of the potential onshore loss is distributed in the six states with the greatest gas volumes produced from federal onshore and Indian lands, as shown in the table below. Significant ongoing federal benefits would accrue through uniform production reporting upgrades in these states.

1992 Natural Gas Sales and Royalty Income from Federal Onshore and Indian Leases

STATE	FEDERAL ONSHORE		INDIAN LEASES	
	Sales Volume (mcf)	Royalties Received	Sales Volume (mcf)	Royalties Received
New Mexico	734,137,293	$133,600,103	45,142,344	$ 9,505,570
Wyoming	308,309,838	58,445,296	5,307,732	2,103,759
Colorado	63,855,694	11,781,494	59,788,870	10,990,326
Utah	45,171,763	7,730,240	8,863,289	3,299,076
Alaska	22,842,381	5,747,143	0	0
Oklahoma	16,854,182	3,419,572	26,087,004	7,559,284

Source: Minerals Management Service, *Minerals Revenues 1992*

A Stronger, More Competitive Natural Gas Industry

One of the long term benefits of more efficient production and supply information flow is a strengthened domestic natural gas industry. As consumer confidence in natural gas production and supply data increases, demand for natural gas as an environmentally benign and domestically abundant source of energy will increase. The resulting increased revenues will allow for greater investment and re-investment in the domestic natural gas industry. A strengthened natural gas industry will provide:

- increased employment in high-tech, high paying jobs within the natural gas industry,
- increased investment in research and development (R&D),
- development of domestic energy resources, and
- increased state and federal revenues.

As the natural gas market continues to stabilize and consumer confidence continues to increase, the natural gas industry can overcome the negative perceptions regarding supply reliability and natural gas can realize its potential as a premier energy source.

Enhanced Gas Market Cost Efficiency

Regulated interstate pipelines are required as a part of the restructuring under FERC Order 636 to implement costly new data, Electronic Data Interchange (EDI), and Electronic Bulletin Board (EBB) systems. Non-regulated entities that wish to remain competitive in the current natural gas market are making corresponding investments in data processing and management. Since many of these entities are both reporters and users of state agency production data, the implementation of new state reporting systems that use the same standards as modern industry systems improves the economics for industry system upgrades. Since regulated companies typically include costs for essential reporting in their rate base, any realized costs savings should ultimately benefit the customers of that pipeline. Without a move toward more uniform production reporting, those entities might be compelled to

maintain duplicative older systems that were designed to meet the complexities of reporting to differing states and agencies. Finally, although electronic gas measurement is not within the scope of the UPRM project, the implementation of more uniform production reporting could encourage its development.

Energy Consumer Interests

Timely and accurate production information is as important to market participants as it is to policy makers. LDC's buying gas on behalf of residential customers, as well as industrial users, must have access to timely and accurate data in order to properly manage their purchases of gas. For example, such information is relevant to an LDC's decision as to whether it contracts for gas on a long or short term basis, whether it hedges spot prices through the futures market, whether it pays a premium over the current spot price in order to ensure a longer term supply, or whether it considers other basins, pipelines or suppliers for its future gas needs.

More Accurate Supply Forecasting. Significant errors or delays in production and deliverability data detract from their usefulness. If timely and reliable data are available, they can be utilized and relied upon for accurate projections of supply to meet anticipated demands. In turn, the short-term price volatility that is motivated by inaccurate projections can be minimized, and producers can more confidently invest in drilling activities to meet future demands.

Enhanced Perception of Supply Reliability. Large-volume energy users are likely to choose clean-burning natural gas as their preferred energy source so long as they perceive that supplies are stable and reliable. Higher quality, accessible data will help demonstrate the reliability of natural gas as a premium fuel.

Reliable Information for the Gas Futures Market. The natural gas futures market, which has a major impact on actual prices paid for gas, is driven in large measure by market assessment of production and deliverability information. If the publicly available production data are flawed or incomplete, a number of negative possibilities arise. Gas industry participants with access to production information have an advantage over those, such as consumers, who do not have that access. The gas market can be, and probably has been, unduly influenced by published conjecture as to reserves and deliverability, even when such projections are not accurate. Estimates from industry identify an average of three cents per mcf as a cost of hedging short-term price volatility. If inaccurate projections inflate consumer gas prices by one to three cents per mcf (which is less than one percent), based on 1993 consumption rates it could cost residential consumers about $50-$150 million per year, and commercial/ industrial/utility consumers about $130-$390 million per year. Timely, reliable and readily accessible data would enhance the functioning of the futures market, and make it less susceptible to fluctuations caused by anecdotal information.

State Benefits

Producing states, in addition to realizing the above national benefits, also would see more specific benefits in the functioning of key state agencies. The producing states depend upon tax, royalty and conservation agency data in order for those agencies to perform their respective functions. As previously noted, changes in the gas market have made those responsibilities increasingly difficult to fulfill. Clearly, any improvement in those production reporting systems will benefit the agencies and the functions they perform.

Enhanced Control of Revenue Processing

Reliable revenue information is crucial to producing states as they seek to manage their gas and oil resources. Timely and accurate data will help ensure that all volumes are accounted for, that the state's resources are being produced in an economical fashion, and that state royalty and tax revenues are collected properly. In some states, concern has been expressed over an increasing trend toward under-reporting of natural gas due to the changed reporting relationships. By reversing this trend through improved reporting systems, these states could recover millions of dollars per year in state tax and royalty revenues. Furthermore, increased cooperation and data sharing among the state tax, royalty and conservation agencies will permit states to meaningfully project future state income derived from gas and oil production.

Decreased System Costs

A significant upgrade in a state agency's computing environment can bring with it the benefits of newer, less expensive technology. These decreased computing costs can be coupled with more advanced development environments that speed application development, thereby reducing ongoing support costs.

Increased Productivity

A new data processing system typically is a re-engineering of current business processes, both automated and manual, to allow those same business processes to be performed systematically and therefore with fewer personnel resources. The UPRM design should allow state agency personnel to focus on more valuable responsibilities, such as verification of data, rather than having to spend time on processes that could easily be performed systematically, such as the validation of input data.

III. PURPOSE

PROJECT GOALS

The primary goal of this project is to develop a conceptual model for the collection, management, and dissemination of natural gas and crude oil production data, consistent with the requirements of the producing and consuming states. To achieve this goal, an assessment of the policies in use or planned by the major natural gas producing states was conducted. The first step in that assessment was to identify and document the best policies and procedures for the effective processing, management, and distribution of production information. These best practices were documented in the form of a high-level conceptual model. In addition, estimated implementation requirements were to be prepared for the adoption of the Conceptual Model across producing states.

This conceptual model would examine and propose flexible and timely production reporting procedures designed to:

- Support severance tax, conservation and public land royalty requirements at the state level;
- Streamline industry reporting requirements;
- Accommodate national data standards emerging from cooperative government and industry efforts; and
- Protect consumers by ensuring an efficient, reliable market with clear pricing signals.

MODEL OBJECTIVES

All recommendations contained in the UPRM Conceptual Model, by definition, are intended to achieve improvements in the overall quality of production data. The following four objectives were defined early in the project to provide a stable frame of reference for judging the relative merit of components of the UPRM Conceptual Model:

- Increase ***timeliness*** in the reporting and distribution of production data;
- Increase the ***accuracy*** of that data at the earliest possible time in the process;
- Increase ***consistency*** of that data by promoting nationally accepted input and output standards or conventions; and
- Increase the ***accessibility*** of that data to users outside each specific state agency.

Increase Timeliness

Increasing timeliness of production data involves reducing the time lag between the end of the production period and the availability of that data. To be valuable to the market and other data users, production data must be available as near the time of production as possible. Data must be collected, validated, verified, and reported by the regulatory agencies. Though modern digital processing can speed transactions, still economic and operational constraints compel some lag in time. Timeliness can be sought at two points: input and output. Current physical and economic constraints might limit opportunities for increasing timeliness at the input end of the state agencies. Conversely, there might be significant opportunities for speeding the release of data from the output end of state agencies.

Increase Accuracy

As highlighted by the experience of the Deliverability Task Force in the Oklahoma Test Case, accuracy of data must be a central objective of a new reporting system. Specifically, a reasonable level of data accuracy must be obtained within an acceptable period of time.

For the first several months following production, data accuracy (particularly for value data) improves in an iterative fashion. New data processing systems, designed to accommodate the heavy volume of post-production month adjustments, should efficiently and accurately validate and post these changes. In the meantime, estimates of data accuracy and completeness should be provided to data users to allow informed decisions.

Increase Consistency

Data consistency is a product of the use of conventions and standards. On a national level, gas industry groups representing buyers, sellers, and consumers of gas are coming to terms on these standards, at times on their own and at times with government encouragement. In general, the adoption of nationally recognized standards would be desirable for all data types; however, in some situations, national standards might require costs that are excessive relative to their benefits. In these cases, a more modest state-wide standard might provide a better solution.

Consistent data facilitates the sharing of data across agencies within a state and provides the infrastructure necessary for automated comparisons of volumes and/or values. In addition, consistent data allows for straightforward comparison of information across states.

Increase Accessibility

Historically, producing state agencies designed their production data processing systems for their own internal use, with only after-the-fact modifications to permit others to retrieve data from their files. Emphasis should include making these valuable public data available by way of multiple media, at multiple levels of aggregation, using a standard output format.

EIA, private sector analysts and others need on-line access to data in its freshest form, albeit at times flagged to mark unresolved discrepancies. Reliable production data must be accessible to consumers and their agents in today's gas market. Reliable production records also must be readily accessible on a prompt basis to the gas and oil exploration industry, for whom they are indispensable tools in the exploration and development processes.

GUIDING PRINCIPLES

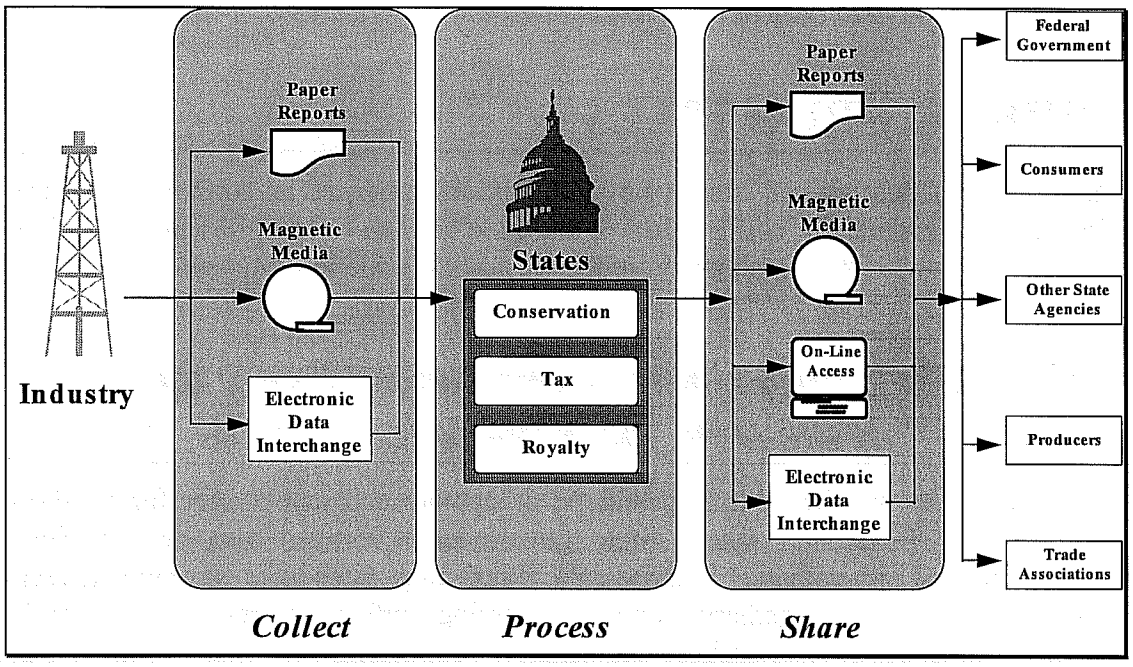
At the outset of this project, certain key assumptions emerged as consensus principles to philosophically anchor the construction of the final model. The following list of guiding principles was used in the development of the Uniform Production Reporting Model.

The State is the Primary Government Entity and "Owner" of the Data for Non-Federal Lands

State agencies are the optimal gatherers, processors and repositories for on-shore and state-waters production data. State governmental entities also are the historical collectors and disseminators of those data. Producing states have enormous investments in production data gathering and processing infrastructures. Data collection responsibility for federal onshore and offshore production does exist within two federal agencies, the Minerals Management Service and the Bureau of Land Management. Beyond that function, the federal government should avoid creating any new comprehensive production data gathering system in addition to those already in place, as such a step would be duplicative and economically inefficient.

Additionally, state agencies have a substantial incentive to maintain systems that meet the key objectives of timeliness and accuracy: state tax and royalty revenues are dependent upon sound production data.

For these reasons, this project assumes that the current flow of information from industry, to the state governments, and ultimately to the users of data is the appropriate approach. Charted below is a simplified presentation of data flow as contemplated under the UPRM.



Rather than duplicate existing reporting to state or federal agencies, the selected approach was to build a model that could be uniformly applied within producing states. The approach of the UPRM thus capitalizes on the historical perspective obtained by upgrading existing processes and systems.

Provide Incentives, Not Mandates

The UPRM is designed to be a voluntary, grass-roots approach to solving the problems related to production data at both the national and state level. It is assumed that participation during all phases of UPRM development -- feasibility assessment, design, installation -- is completely voluntary on the part of the producing states. It is further assumed that DOE may elect to encourage states to participate in the effort through creative incentives such as the cost-sharing of hardware and software acquisition. Note that no assumption is made about the *specific methods* DOE may use to encourage participation.

Ensure Flexibility for State Adoption

The UPRM seeks to combine the most effective processes and procedures of all producing state agencies. It is important to recognize that a high-level model defined at a *national* level will almost certainly have aspects that do not fit with the realities of individual states. It is crucial that the UPRM reflect the best practices, but maintain a flexible structure to allow individual state adaptation.

Strive for Simplicity

A primary contributor to data quality problems is the sheer level of complexity in the energy business, the associated regulatory processes, and the production data itself. The problem is further magnified when states have differing reporting requirements, processing methods, and data distribution practices. Data reporters, processors and users face unnecessary complexities that can be alleviated by *any* adoption of more uniform production reporting practices. Within the UPRM Conceptual Model, every opportunity is taken to simplify and streamline the human interfaces with the processing system, i.e., let the system rather than the people handle these complexities. The goal of this simplification is not only the improvement of data quality, but also the reduction of resources required to report, process, and use production data for the energy industry, government agencies, and the spectrum of data users.

Provide for Cross-Agency Sharing of Data

State agencies involved in the oversight of the gas and oil industry utilize extremely similar data. Given that, the UPRM project has attempted to identify opportunities for sharing both common reference and transaction data. Such sharing will increase the effectiveness of the agencies involved and ultimately will produce higher quality data. Specific considerations for this guiding principle include:

Store Data at the Lowest Common Level

By storing data at the lowest common level, agencies or users of production data will be able to aggregate data to the level appropriate for the task at hand. In the UPRM, that level is the individual well completion level within a well bore where separately measured and reported; otherwise, the well bore level is the lowest common level.

Define the Data Model Based on True Business Entities

Many older information systems utilize artificial keys for storing and accessing data, many without regard to the actual business situations being addressed. This approach yields systems that are inflexible and expensive to maintain. By developing a rigorous data model based on true business entities (e.g., well completions, leases, units, etc.), a state's conservation, tax and royalty agencies will benefit from long-term flexibility and economy.

Define Common Reference Data and Relationships

Data that are collected and maintained by different agencies typically reflect different entities and data levels. To compare data across agencies, a common set of reference items (i.e., entity identification codes) must exist, along with the identified

relationships between entities. For example, links should exist between each lease and the wells that are on that lease.

Ensure the Verification of the Data

To increase the accuracy of the data, the UPRM identifies opportunities for enhancing data quality through a three-stage process of data validation, data verification and cross-verification. While some of these data quality steps are currently performed by some state agencies, systematic progress to the cross-verification stage typically is not possible within current systems.

Data validation is the initial screening of data transactions to reject clear and gross errors and would include checks for non-numeric production values, invalid well or operator numbers, etc.

Data verification is the more sophisticated internal agency data editing which would analyze records after transactions have been posted and flag order-of-magnitude errors and other concerns about the data. For example, a well that normally produces a daily volume of 10 mcf that suddenly jumps to a daily volume of 100 mcf would be identified during data verification.

Cross verification is the inter-agency comparison of one agency's data against comparable data reported to other agencies. For example, a tax agency can cross-verify purchased volumes against measured volumes reported to the conservation agency.

Utilize Existing or Emerging National Standards

This project specifically avoids defining new standards for the categorization or transmission of production data. It does seek to incorporate standards generally accepted by industry and government to discourage producing state agencies from adopting unique conventions not shared by other states, agencies or industry.

State Standards

The UPRM effort distinguishes between standards that have national application, and standards that would operate best on a state-by-state basis. State specific standards would be appropriate in situations where the economic benefit of utilizing a national standard is not sufficiently great as to offset the required cost of using the standard. For example, state taxing agencies normally have rigorous requirements for the definition and use of taxpayer identification codes. No suitably stable standard exists on a national level, and the development of such a code would almost certainly prove expensive.

National Standards

Through joint efforts of trade organizations such as API, COPAS, AGA, INGAA, NGSA, IPAA and others, many valuable national standards have emerged. These standards have emerged for both the identification of entities (e.g., well bores, transaction points, etc.) and for the communication of data between business partners (e.g., REGS EDI transaction datasets based on ANSI standards). The UPRM attempts to identify all relevant standards and uses those standards that are suitably stable and economically defensible for implementation.

Anticipate Interface to A Transportation Model

The UPRM project focuses exclusively on the production segment of the gas and oil industry. No recommendations are made about downstream activities such as transportation, storage, or consumption. Although *this* project does not address such components, future efforts may prove necessary to define similar standards. Given that, it is important that the UPRM recognize interface points to the next logical aspect of an overall model. That next logical step would involve the removal of product from the lease by the transportation segment. Specific consideration should be given to these interface points and flexibility should be included to the extent practical so that long-term inter-connectivity between models can be maximized.

Focus on Data Users

One of the primary catalysts for the UPRM project was the lack of quality production information for data users. While the need for deliverability data provided the initial impetus, the resulting systems also need to accommodate other uses for production data. It is imperative that this effort continually focus on ways to provide data to various users in a manner that is both effective and economical.

Anticipate Future Demands on State Systems

A stock axiom in data system design is that extra attention spent in the planning and design phase of a system can substantially minimize cost and wasted effort during the implementation and use of the system. In the context of the UPRM, this project has attempted to identify, at a high level, any potential long-term demands on state systems utilizing UPRM concepts.

DEFINITION OF SCOPE

The UPRM project focused exclusively on improving the data associated with the production of commercial hydrocarbons. This definition of scope makes the following specific assumptions:

- Only the ***production*** portion of the gas and oil value chain is addressed. No attempt is made to address transportation, storage, or consumption.

- Only ***commercial hydrocarbons*** are addressed. No attempt is made to address other, non-salable products such as water. In addition, no attempt is made to address salable non-hydrocarbons such as sulfur.

This narrow definition of scope was imperative to ensure that the resulting guidelines were sufficiently focused so as to provide the most value for future systems. Other factors such as those mentioned above may be of sufficient importance as to warrant separate study in a manner similar to that given UPRM. The following sections explain in more detail the UPRM's strict definition of scope:

Production vs. Transportation and Storage

One of the original drivers for beginning this project involved questions surrounding natural gas deliverability data. Deliverability can be quantified at various points along the delivery stream: from wellhead to burner-tip. This project has focused exclusively on production information, the beginning of the gas and oil data chain. It does not attempt to address transportation or storage volumes or any other aspects of deliverability. These areas are sufficiently complex to deserve separate treatment in a manner similar to this effort.

All Commercial Hydrocarbon Products vs. Natural Gas Alone

Again, although this project is tasked to review natural gas production data, state reporting systems process that data with other hydrocarbon production data. Given the highly integrated nature of gas and oil data, it was deemed appropriate to investigate both major products.

Although other valuable minerals, such as sulfur, are often extracted along with hydrocarbons, their inclusion in a system would be a state-specific non-core activity not specifically addressed by this study. Some states also collect data on waste products, such as salt water, the inclusion of which is not a part of this model. Nonetheless,

implementation of the UPRM by a producing state would provide a cost effective opportunity for a state to upgrade the gathering and assessment of those data along with production data for commercial hydrocarbons should it so desire.

Inclusion of Marginal Production and Cost/Benefit Analysis.

In some of the older hydrocarbon producing regions of the country, many of the wells have depleted to a point so near to the end of their economic lives that they cannot bear further increases in operating expense (such as materially increased reporting costs). Situations and specifics such as these must be addressed on a state-by-state basis and are therefore not addressed by the UPRM.

Implementation - Government Costs vs. Industry Costs

The relative potential of various proposals and guidelines to trigger changeover costs for industry could be generally approached, but any detailed quantification of those costs is outside the scope of this project. The level of changeover costs is highly dependent upon both the current and proposed reporting requirements of a specific state, *i.e.*, the requirements that exist today, the specific changes that are proposed, and the costs and efficiencies arising from those changes. Also, the number and size of companies doing business in a particular state would need to be addressed. Ultimately, a cost/benefit and impact assessment of proposed reporting changes on industry would need to be performed at the individual state level as each state formulates its own state upgrade plan or proposal.

Production vs. Deliverability

Production data sets forth what hydrocarbons *have been produced.* Deliverability is a projection of what hydrocarbons *can be produced*, given a set of assumptions. The FERC/DOE Deliverability Task Force looked at the types of information that would be needed to make a defensible estimation of the nation's natural gas deliverability. As their final report highlighted, modeling or estimating deliverability is a complex endeavor that is highly-dependent upon timely and accurate production data. This project builds upon that finding and provides a means of improving production information. It does not attempt to estimate deliverability.

Core vs. Non-Core

State conservation, royalty, and tax agencies are charged with many functions that do not relate directly to the capture and processing of production data. While these functions

are vital and integral functions of the agency, they do not directly impact the scope of this effort.

In order to correctly focus this effort, it was necessary to define **Core** functions and **Non-Core** functions. For purposes of the UPRM, Core functions are those directly related to, or are necessary components of, the capture and processing of production-related information. Some functions that might appear to be related to the production reporting process were treated as Non-Core if such processes had little likelihood of being uniformly handled throughout producing states. Examples of such Non-Core processes would be conservation agency well spacing and calculation of allowable production.

Volumes and Values

The emerging natural gas marketplace will continue to demand information appropriate for the efficient operation of the market. The information demanded includes both volume *and* value. For this reason, both volume and value information are addressed by the UPRM. Note that this definition of scope introduces additional complexities and requires significant input from royalty and tax agencies in the producing states. This additional complexity is more than offset by the increase in the value of the final UPRM product, and for that reason, will be addressed.

The Limits of Real Time

"Real time" transfer of data is normally defined as the transfer of data simultaneously with the transaction giving rise to the data; i.e., production data is reported as it is produced. Real time transfer can also be defined on the *output* side, from the agency systems to other data users.

Input

The UPRM has attempted to determine the degree to which production reporting processes can approach real time. Because of costs and practical consideration, true "real time data" are probably not an economically feasible goal in the *current* state of the gas industry. For this reason, "real time" input data is not addressed by UPRM, although the model does include the flexibility to incorporate real time input should it develop.

Output

The advances in system hardware and software make real time output from state systems an economic and achievable goal. As data are received and validated, they immediately can be made available to the users of the data through on-line access, EDI, etc. For this reason, "real time" output of data will be addressed by the UPRM.

IV. METHODOLOGY

INTRODUCTION

The general methodology for performing this project consisted of researching existing gas and oil reporting procedures, identifying those procedures which were most effective, and then developing the UPRM Conceptual Model. State, federal and industry input were all considered critical to this process. Major tasks were defined as follows:

- Review and document current systems and procedures that are involved in the collection, processing and sharing of production-related data for state agencies, the Minerals Management Service (MMS), and the Bureau of Land Management (BLM).

- Identify those procedures and ideas that are working effectively and also identify any significant problems encountered by agencies in the processing of gas and oil production-related data. From this information, begin to outline recommendations and potential solutions to identified problems.

- Document the recommendations in the form of a high-level conceptual model, outlining the generalized flow of production-related data from industry, through states and to the end-users of the data.

- Validate the Conceptual Model through discussions with states and additional stakeholder groups.

- Approximate the order of magnitude requirements for implementing the recommended conceptual model in various producing states.

From the outset, the project's time frame would not allow as much detailed research and feedback as might be desirable. Given this, the project was designed to solicit and incorporate as much information as possible within a short period.

SOURCES OF INPUT

The UPRM project team members positioned themselves as the "scribes" of the UPRM model. The true architects of the model were the employees of the primary agencies in the major producing states. This philosophy reflects the reality that the true experts in this field are those who are involved with the management of gas and oil resources on a day-to-day basis. Those states that produce the greatest volumes of natural gas were specifically targeted in the data collection effort. In addition, other stakeholders in gas production data processing - both data reporters and data users - provided critical input on the development of the model.

Advisory Committee of State Regulatory Officials

W. Timothy Dowd, then Executive Director of the Interstate Oil and Gas Compact Commission (IOGCC), was asked to provide a list of state regulatory officials who might serve on the Uniform Production Reporting Model (UPRM) Advisory Committee. Designated committee members were asked to participate in a series of project review meetings. These committee members became important sources of initial information for the project. Committee members included representatives from major gas producing and consuming states, and from the Minerals Management Service (MMS) and the Bureau of Land Management (BLM).

Major Producing and Consuming States

The UPRM Advisory Committee included representatives from major gas producing and consuming states, including:

- Kansas
- Louisiana
- New Mexico
- Ohio
- Oklahoma
- Texas
- Wyoming

Additional Committee Membership

Additional membership on the committee included representatives from:

- Minerals Management Service (MMS)
- Bureau of Land Management (BLM)
- Energy Information Administration (EIA)

Target State Agencies

State agencies that are involved in the oversight of the domestic petroleum industry collect gas and oil production data in support of their regulatory efforts. Representatives from target state agencies in Kansas, Louisiana, New Mexico, Ohio, Oklahoma, Texas and Wyoming were asked to provide information on current methods of collecting gas and oil production data and on suggested enhancements to existing systems. In addition, since federal onshore and offshore lands produce significant volumes of natural gas, the Minerals Management Service (MMS) and the Bureau of Land Management (BLM) were asked to provide input regarding their data management strategies for their lands. With this group, regulatory oversight for over 90% of the U.S. natural gas production is represented.

Conservation

Conservation agencies monitor gas and oil wells throughout their "spud-to-plug" life cycles. In support of their regulatory activities, conservation agencies collect and maintain information on drilling, well completions, well tests, unitizations, production allowables, gas and oil production, plugging and abandonment.

Tax

Tax agencies collect gas and oil production and sales data in support of their processing of taxes on volumes sold. In order to effectively optimize state revenues, these agencies must monitor closely the volume and value data submitted to them. Tax agencies also must have access to other production-related data in order to review and process requested tax exemptions and to conduct periodic audits.

Royalty

Royalty agencies collect gas and oil production and sales data to support their processing of royalty payments on public lands. Royalty agencies also need access to production data collected by other agencies in support of their audit functions. Although Royalty agencies collect information only on public lands, in some states public lands constitute a large portion of the total gas and oil producing areas.

Additional Stakeholders

Stakeholder groups representing the federal government, industry, regulatory agencies, public utilities, royalty owners and other groups all have a vital interest in issues related to gas and oil production reporting. Consequently, input from these groups was considered essential in order to gain a complete understanding of the requirements for the development of a Uniform Production Reporting Model.

Feedback on specific project issues was requested from the following stakeholder groups:

- American Gas Association (AGA)
- American Petroleum Institute (API)
- Council of Petroleum Accountants Societies (COPAS)
- Energy Information Administration (EIA)
- Edison Electric Institute
- Federal Energy Regulatory Commission (FERC)
- Federation of Tax Administrators
- Independent Petroleum Association of America (IPAA)
- Interstate Natural Gas Association of America (INGAA)
- Interstate Oil and Gas Compact Commission (IOGCC)
- Kansas/Oklahoma Division of the Mid-Continent Oil and Gas Association
- Mid-Continent Oil and Gas Association
- National Association of Royalty Owners (NARO)
- Natural Gas Supply Association (NGSA)
- National Association of Regulatory Utility Commissioners (NARUC)
- Oklahoma Commission on Marginally Producing Oil and Gas Wells
- Oklahoma Independent Petroleum Association (OIPA)
- REGS User Group - affiliated with the Revenue and Electronic Data Interchange Committees of the Council of Petroleum Accountants Societies (COPAS) and the American Petroleum Industry (API) Data Exchange (PIDX) Committee

The practical limits of the project calendar prevented the inclusion of more stakeholder representation. The long-term success in the evolution of UPRM will depend heavily on the continued input of additional stakeholders.

APPROACH

The model development was an iterative process of collecting production processing details, extrapolating from those details to define high-level generalizations, and then validating those generalizations through additional reviews of processing details. Specific activities are described below.

Project Kickoff

A project kickoff meeting was held in Tulsa, Oklahoma on June 29, 1993 with members of the Uniform Production Reporting Model (UPRM) Advisory Committee and the UPRM project team.

Project Presentation

The UPRM project team presented project background information and outlined project goals and time frames. The current status of the petroleum industry and the need for more consistent, accurate and timely production data were discussed.

Request for Participation

UPRM Advisory Committee members were asked to assist in initially defining problem areas in current state and federal production data processing. Committee members also were asked to participate in project review meetings to be held in October and November, 1993.

Identification of State Contacts

UPRM Advisory Committee members were asked to identify key people from the Conservation, Tax and Royalty agencies within the target states who could act as contacts for the project. These key people were then contacted by the UPRM project team and were provided with project background information. State contacts agreed to complete questionnaires requesting specific information about state systems.

Review Current State Systems

Research State Characteristics

UPRM project team members conducted research on published gas and oil information in order to collect information on the state characteristics for all producing states. Various publications were reviewed including EIA monthly and annual reports, the IOGCC Summary of State Statutes, and various API publications. State characteristics were recorded for all producing states and were reviewed and discussed with agency representatives for the specific target states.

Review Existing Standards

The project team also conducted research into various standards that exist related to the reporting of gas production data. Some standards (such as the FIPS County Codes) have such widespread use that they are not even addressed in the model. Other standards are only partially implemented or developed within states. The Petroleum Industry Data Dictionary (PIDD), being developed under the auspices of the American Petroleum Institute (API), is an effort to more fully address data standards issues. Some of the key standards issues for the UPRM model are listed below.

Well Numbers. Information on coding formats for API Well Bore Numbers and API Well Completion Numbers was reviewed. UPRM project team members discussed the use of API Well Bore and Completion Numbers with state agency representatives for the target states.

Business Associate Codes. National and state approaches for assigning codes to business associates were reviewed. Project team members addressed the feasibility of assigning uniform codes to operators and other business associates within individual states or at a national level.

Communication Standards. Communication standards including standards and conventions for Electronic Data Interchange (EDI) were researched. Recognized standards and conventions are discussed fully in Appendix E.

Transaction Point Codes. Standards for identifying transaction points such as meters or custody transfer points were reviewed. Evolving national standards such as the Petroleum Information (PI) GRID Codes were examined and are further discussed in Appendix F.

Preliminary Input

Oklahoma state agencies played a key role in providing preliminary information which helped to identify procedures common across states and agencies that process gas and oil production-related data. During a series of working meetings in July, 1993, Oklahoma state agency representatives outlined their current systems and procedures, and identified many of the problems and issues which they face.

UPRM project team members used the information gathered during these preliminary meetings to develop an investigation framework for the project.

Investigation Framework

The investigation framework for the project emphasized the major phases and key business events in a typical well's life that require state agency involvement. UPRM project team members recognized that each state agency has different roles and statutory requirements, and that each is involved in regulatory activities during different stages of a typical well's life. The investigation framework for the project was therefore modeled after the producing life of an ordinary well and was intended to cover the important aspects of a well's life from "spud-to-plug".

Major Phases. For the purposes of identifying and understanding current business processes within state agencies, the life of a normal well was divided into three major phases:

- Develop
- Produce
- Abandon

Business Events. The three major phases of a well's life were further divided into twenty discrete business events that represent significant milestones in a well's life. For the purposes of this project, only selected events were considered for primary emphasis. Primary or "core" business events were defined as those that are directly related to the capture and processing of production-related information. Secondary or "non-core" business events were defined as other business events that are not directly related to the capture and processing of production-related information.

Questionnaires

Packets containing questionnaires designed to solicit information on current methods for reporting gas and oil production data were sent to state contacts within the target states (Kansas, Louisiana, New Mexico, Ohio, Oklahoma, Texas, and Wyoming) and to MMS and BLM. Questionnaires were comprehensive and required significant time and effort on the part of state agency representatives. The packets were sent during the first two weeks of August, 1993 with responses requested by the end of August. Although the time frame was very short, all of the state contacts were very responsive.

The Questionnaire, provided in Appendix D, included the following components:

Organizational Questionnaire. In order to gain a better understanding of state agency structure and overall objectives as they relate to gas and oil production functions, the Organizational Questionnaire asked specific questions regarding state statutes and informal agency objectives. Agencies also were asked to provide an organizational chart for reference purposes.

Systems Questionnaire. The Systems Questionnaire asked specific questions about the current systems used for gas and oil production information and the functions processed by each system. Agencies were asked to furnish information on each automated system used for gathering, processing and reporting gas and oil production-related data.

Business Events Questionnaire. Background materials introduced the investigation framework used to examine states' current systems and business procedures. Each agency was asked to verify specific business event flows and event descriptions as they relate to gas and oil production functions. Agencies also were asked to provide any additional information that they considered critical to understanding their processing of gas and oil related data.

Conceptual Model

A conceptual model is a high-level design of an information system. The intent of such a design is to capture the general requirements of the anticipated system, and to provide a first-draft of the major functions and features to be provided.

Based on the preliminary input received from state agencies and on the review of the returned questionnaires, an initial Conceptual Model or "straw man" was developed. The initial Conceptual Model began as a compilation of the most effective procedures identified during state system reviews. The model was intended to provide a high-level conceptual overview of an ideal system and also was intended to elicit comments and revisions during subsequent contacts with state agency representatives. A copy of the final Conceptual Model is included in Appendix A. The main components included within the Model are listed briefly below and are discussed more fully in the Results and Discussion Section of this report.

Business Events. The Business Events Section of the Conceptual Model provides a high level description of the business events that require regulatory oversight during the life of a typical well, including a generalized flow diagram of the processes. Each business event documents the relevant:

- Uniformity Guidelines;
- System Functions;
- Conceptual Data Stores; and
- Entities

that are further described in subsequent sections.

Uniformity Guidelines. The Uniformity Guidelines are a set of specific recommendations for procedures that would foster uniformity of production-related data and promote the model objectives of timeliness, accuracy, consistency, and accessibility.

System Functions. System Functions descriptions were developed in order to provide an overview of the functions and features normally required to support state agencies involved in the oversight of the petroleum industry.

Conceptual Data Stores. Data stores are simply general repositories of similar information. While they might reflect distinct databases or tables in a final system design, they are not necessarily designed for that purpose. The Conceptual Data Stores were defined at a high level and were intended to provide an example of the data that may be contained in each data store.

Entity Relationship Data Model. The Entity Relationship Data Model was developed in order to provide a better understanding of the business entities involved in the petroleum industry and their relationships with one another. The data model was designed to provide a general approach for capturing information about entities and their relationships, recognizing that these might vary somewhat from state to state.

Work Sessions

UPRM project team members participated in numerous working sessions to discuss the information contained in the completed questionnaires received from state agencies and to develop, review and refine the individual components of the Conceptual Model. The working sessions were intended as ***data gathering sessions*** - during which UPRM project team members collected data for the initial development of the Conceptual Model; and ***review sessions*** - during which UPRM project team members reviewed and refined the Conceptual Model and the Implementation Requirements.

Data Gathering Sessions. Project team members conducted site visits with state agency contacts and key agency staff beginning in July, and continuing through September, 1993.

Site visits were conducted with the MMS Royalty Management Program in Denver and the BLM (Denver office), and with state agency contacts in Louisiana, Oklahoma, and Texas. Information obtained from the completed state questionnaires was reviewed during the site visits, and additional information was discussed.

Teleconference calls were conducted during September with additional state contacts and key agency staff in Wyoming, Kansas, and New Mexico. During the calls, completed questionnaires were reviewed and specific issues were discussed in order to obtain a better understanding of current procedures and potential enhancements.

In addition, the written responses to the questionnaire received from Ohio were reviewed and incorporated.

Review Sessions. Project team members conducted detail reviews with key state agency staff in Oklahoma and New Mexico beginning in September, and continuing through October, 1993. Numerous site visits with Oklahoma state agencies provided an iterative review of the Conceptual Model. In addition, a site visit to New Mexico provided the opportunity to compare the Conceptual Model with ONGARD®, their newly redesigned production reporting system.

Implementation Requirements

Order-of-magnitude requirements were approximated for the implementation of the UPRM's Conceptual Model and Uniformity Guidelines in various producing states. Requirements were developed for the following major components:

- Labor (both state and external labor supplies)
- Hardware/system software

These requirements were approximated for an implementation in various states by using the following basic methodology:

1. Develop requirements estimates for a hypothetical state with approximately 40,000 producing wells.
2. Verify these estimates with a state with known costs.

3. Extrapolate these requirements to the remaining states.

Specific details of the implementation requirements are included in Appendix B.

Review and Refine the Conceptual Model

UPRM Preliminary Review

A project review meeting was held in Dallas on October 7, 1993 with members of the Uniform Production Reporting Model (UPRM) Advisory Committee and the UPRM project team. Background information was reviewed and the preliminary Conceptual Model was presented to the Advisory Committee for review and comments.

Contact History Overview. Project team members reviewed the approach used to contact key people from the Conservation, Tax and Royalty agencies within the target states.

Overview of Conceptual Model. Individual components of the Conceptual Model were reviewed, and committee members were asked to provide feedback on any issues that might affect the final Conceptual Model.

Overview of Uniformity Guidelines. A more detailed presentation of the preliminary Uniformity Guidelines was given to the UPRM Advisory Committee members. Committee members were asked to provide feedback on the specific recommendations outlined in the Uniformity Guidelines as they relate to internal state interest group concerns and to organizational and statutory requirements. An in-depth discussion of each guideline provided essential feedback for project team members. Discussion points and concerns were recorded and reviewed in subsequent UPRM working sessions.

Identification of Hurdles. UPRM project team members asked the Advisory Committee to identify potential hurdles that individual states might face if they attempt to implement the Conceptual Model with its Uniformity Guidelines. Recommendations for addressing those potential hurdles also were requested.

UPRM Focus Group Review

A Focus Group conference was held in Norman, Oklahoma on November 9 and 10, 1993. UPRM Advisory Committee members, key state agency contacts and federal representatives were invited to review and discuss the overall Conceptual Model and the Implementation Requirements.

Overview of Conceptual Model. The overall Conceptual Model was presented to conference attendees along with a review of project background and current project status information. Group discussions provided valuable feedback for UPRM project team members.

Uniformity Guidelines Working Sessions. Conference attendees participated in group sessions broken out by agency type (Conservation, Tax, and Royalty) and then by state in order to closely review each Uniformity Guideline. Conference attendees were asked to identify any problems that their state agencies might face in attempting to implement the Uniformity Guidelines.

Attendees also were asked to assign guideline weights and to indicate the potential for state adoption of individual Uniformity Guidelines. Open discussions provided for a sharing of ideas between states and agencies.

Discussion of Implementation Requirements. Conference participants were introduced to the Implementation Requirements, which provided a broad overview of the approximate costs for implementing the Conceptual Model in various states. An overview of the methodology used to determine approximate costs was discussed, and a summary of implementation requirements including an assumed work plan was presented by UPRM team members. Methods for verifying requirements were also discussed.

Long Term Strategies. UPRM project team members and conference attendees discussed long term strategies for moving forward with implementation of the Conceptual Model and Uniformity Guidelines within individual states. Conference attendees discussed potential hurdles that their states might face and recommendations for addressing those hurdles. State agency representatives also discussed funding options and internal state strategies, such as the development of a state task force.

Stakeholder Review

UPRM project team members contacted stakeholder groups representing a wide variety of interests in gas and oil reporting issues. Project background information and specific project goals were discussed with these groups, and feedback was requested on specific project issues. In addition, designated members of the stakeholder groups were asked to review the Conceptual Model, with particular emphasis on the Uniformity Guidelines, and to identify issues and concerns that might impact the final UPRM.

Project Finalization

After receiving and reviewing extensive input from all the sources previously discussed, the project team finalized all documentation for the effort including:

- The project report
- The final Conceptual Model
- The final approximate implementation requirements
- Supporting documentation.

V. RESULTS AND DISCUSSION

RE-STATEMENT OF NATIONAL PROBLEMS

As discussed in Section II, Introduction and Background, two distinct problems have been identified at the national level with respect to natural gas production data.

1. There is an Increasing Need for Reliable Data

Dramatic changes in the natural gas marketplace have increased the national need for reliable production data.

2. There is a Decreasing Ability to Provide Reliable Data

The data gathering systems of the producing states have been overwhelmed by changes in the natural gas marketplace and do not provide reliable production data.

While these problems reflect national-level concerns, the UPRM search for a resolution was at the state-level. The methodology of the UPRM project provided opportunities to obtain detailed information about the strengths and weaknesses of each agency's business processes. This research led to several fundamental project findings.

FINDINGS

Introduction

The primary purpose of the Uniform Production Reporting Model (UPRM) is to identify and document the most effective concepts related to the processing of gas and oil production data. The development of the UPRM involved many detailed working sessions with various stakeholders and, by definition, was focused on state processing and problems as related to natural gas production data. The following sections present the major findings of this effort and provide specific examples of the state-level problems identified.

1. There is a Need for Change at the State Level

Agencies involved in the management of state gas and oil resources are being asked to provide value in an increasingly complex environment at a time when there are consistently fewer resources with which to respond. The following problems underscore the urgency of the need for change:

Out-Dated Information Systems

Many state agency representatives expressed concerns about the status of their information systems. These systems are either reaching or have passed the end of their productive lives. Many were developed in the 1970's and suffer from the following problems:

The petroleum industry has fundamentally changed since the time of original systems development. As discussed in Section II, these changes have been especially prevalent in the natural gas industry, where the fundamental roles and responsibilities of industry players have been altered. For example, many states rely on the first purchaser of natural gas to report information to the state. This approach was completely appropriate when pipeline companies played the merchant role, but in the new marketplace, the first purchaser of the gas may not be located in the producing state, may not be aware of the specific source of the gas, and may not be aware of these reporting obligations. Situations such as these are increasingly difficult to identify and are not being handled well by the systems developed for a different marketplace.

The systems have been maintained, or "patched" to the point of dis-repair. All information systems have a limited life span, the number of years being dependent upon factors such as the technology used and the evolution of new applications. An "average" system has a life span of 5-7 years, far less than the normal age of today's state production systems. As systems grow and are maintained, their flexibility decreases. This is a normal phenomenon encountered by systems in all industries. This lack of flexibility develops to the point that the fear of unexpected side-effects makes programmers extremely reluctant to make any additional changes unless they are absolutely necessary. Given the advanced age of most state production systems, it is understandable that they are largely unable to be altered to reflect changing requirements.

Original technology does not provide the productivity levels expected of modern information systems. Many current systems were developed using inflexible technology designed to minimize the use of what was then expensive hardware. Technology advances have sent hardware costs plummeting, opening new doors to software that dramatically increases personnel productivity. Increases in productivity can be expected from the use of advanced development tools by information systems personnel, and from the use of advanced data query and analysis software by agency users. By replacing the older technology, state agencies stand to see dramatic increases in productivity.

Newer and less expensive technology has been developed that provides for more cost-effective processing of information. Cost savings are available not only at the time of acquisition, but also during the operational life of the equipment. Many state agencies can reap immediate benefits by shifting from older, more expensive technologies to newer, less expensive ones.

Lack of Standardization

Across States. There is no single body of uniform standards that provides global direction for state data collection efforts. For example, oil production information may be reported at the county level in one state, but at the well level in another. In those situations where states do work at the same level (e.g., well), there is no guarantee that the coding schemes used by the states are the same. For example, one state might identify wells using an API well number, while another uses a proprietary, state-specific code.

Within States. Within an individual state, it is very common for different agencies to work at different *levels of aggregation.* For example, a conservation agency might focus on individual wells, but the taxing authority is more interested in aggregating multiple wells into taxable groups. Although the underlying data are fundamentally the same (i.e., producing entities), there is no

standard scheme for linking data across agencies in many states. There is simply no way to automatically cross-link and therefore cross-verify data.

Isolated Agencies

Commonly, the three primary agencies (conservation, tax and royalty) that regulate the gas and oil industry are isolated from one another. This situation exists despite the fact that the three agencies work largely with the same group of companies, on many of the same issues. There are considerable opportunities for leveraging the value of the three individual agencies into something greater than the sum of the parts. Examples of the problems encountered are as follows:

There is no central oversight of a producing well from "spud-to-plug". Each agency has its own view of a particular well, and these views can vary significantly. For example, the conservation agency is interested in collecting accurate well completion and well abandonment information, but has no vested interest in providing that critical status information to assist in monitoring royalty and tax functions. All three agencies can benefit significantly from a system which would automatically notify each agency when a significant event has occurred in the life cycle of a well.

There is little or no sharing of data across agencies. Many states have essentially no contact between the three agencies, while some periodically exchange magnetic tapes containing historical detail data. In some states, agencies have to rely on private firms as a source for needed data that should be available through coordinated state efforts.

The three agencies typically develop and maintain separate information systems. This historically duplicative effort is continued even through the underlying reporting industry is exactly the same for each agency. Each well in the state requires both conservation and tax oversight. Given this significant overlap, it is appropriate for the three agencies to share an extensive subset of their information systems.

Overloaded Agencies

State agencies are largely overloaded due to increasing complexity in the industry, fundamental changes in the industry, and insufficient systems support. These factors, taken together, have forced state agencies into a very reactive position; focusing only on the most pressing problems each day. By increasing productivity and removing non-value-added activities from personnel, state agencies stand to provide greater value to the industry they serve, as well as to the public at-large. The following points summarize state agencies' current situation:

The nature of the industry has changed. As noted in Section II, the petroleum industry is changing in ways that increase the workload of the state agencies. Agencies are accustomed to dealing primarily with a few large operators that are responsible for most of the wells in the state. As domestic production declines and the major companies seek larger returns, they are selling many domestic onshore properties to smaller companies and independents. Agencies were designed and staffed for dealing with these larger companies that had specialized staff to handle all reporting and remittance processing. As a greater percentage of wells are being managed by an increasing number of smaller operators, the workload on agency employees increases. Since the smaller companies do not have the specialized staff to focus on meeting the reporting needs of each respective state, state employees are forced to spend an increasing amount of time supporting operators as they take on the new responsibilities. This increase in workload has not, in most cases, been adequately addressed by increased agency staffing levels.

Natural gas market complexity demands special attention. The continued deregulation of the natural gas market has increased the level of complexity involved in the management of natural gas resources. As mentioned before, the apparently simple process of identifying the first purchaser of gas is no longer a trivial task, and a new first purchaser might need additional assistance to understand and meet reporting requirements. This purchaser may, in fact, be a marketer in New York or Chicago who owns no physical assets in the state of production.

Limited Sharing of Data Outside State Agencies

State systems are largely out-of-date and are unable to provide data to users outside the specific agency. Given this, data is inaccessible to users of the data such as producers, LDC's, and national policy-makers. Users outside of the state agencies are unable to economically access data because data are not available on-line, or are maintained at such a raw level of detail as to make use impractical.

2. *There is Support For Change Within Industry*

In developing the UPRM, it was important to solicit the input and opinions of industry participants, both as providers and as users of production data. Agencies in producing states are sensitive to the need to support a healthy industry within their states, and support a partnership approach to their interactions with industry. Industry representatives were, overall, enthusiastic about the idea of a more uniform approach to the collection and processing of production data. These representatives recognize that the interactions between states and industry are necessary, and can be mutually beneficial. Given that, they were supportive of any initiative that would simplify the reporting process without causing any degradation of the underlying production data system. The following items explain the rationale for this support.

Reduced Administrative Burden

Given the continued competitive pressures in the domestic petroleum industry, lowered administrative costs would benefit all segments of the industry as well as the consumer.

Large and mid-size companies operate in multiple states and stand to benefit from a more standard interaction with all states. These operators must now report information to different agencies in different states using different mechanisms. No two report formats are the same, and only a subset of state agencies allow a limited filing of information electronically. A more uniform approach would provide economies-of-scale to these operators.

Small companies spend a disproportionate amount of their time managing administrative matters. Whereas the larger operators have dedicated staff who manage the reporting requirements for many wells, smaller operators are forced to have employees perform "double-duty". In many instances the companies' engineers or secretaries must prepare reports for state agencies. Given an average 40-hour work-week, any reduction in administrative burden allows those employees to better focus on their primary tasks.

Increased Accessibility of Valuable Data

The availability of high-quality data for industry users will benefit industry's financial "bottom line" by both reducing their data acquisition expenses and increasing their potential revenues. Specifically:

Lower expense associated with acquiring data can be realized by those companies needing state-collected information. The ability to access data from several states in a uniform manner eases the costs of data manipulation. In states where data is not provided electronically, and all information is available *on paper*, at a *central site* only, significant personnel resources are required to

obtain needed information. All of this additional burden could be removed if the state simply provided uniform data via on-line access or in a standard electronic format.

Increased data quality supports better decision-making. Higher quality data allows industry to make better, more informed decisions. Again, the increasingly competitive domestic energy industry necessitates sound decision-making based on solid information.

3. Change is Possible

The UPRM represents the best available concepts for managing a state's gas and oil production reporting. The specific Uniformity Guidelines contained in the UPRM have, in large part, been obtained from the actual practices of the producing states. That is, most of the guidelines are already being utilized, in some fashion, in some state(s). The fact that a specific guideline is already being performed in a state indicates that it is possible to implement that same guideline in another state, barring any statutory or state-specific industry barrier.

Given this, it is reasonable and appropriate to think that a broad implementation of most of the Uniformity Guidelines is possible. The UPRM project team received extremely positive feedback from state agency representatives who were presented with the possibility of such an implementation. It is important to note that New Mexico is well into a complete systems redevelopment effort that is very compatible with the basic tenets of the UPRM, and at least one other state has begun investigating such a process. The overall feasibility notwithstanding, a UPRM implementation effort will require the careful consideration of several factors.

Changeover Costs

The changeover costs from a state's existing policies and procedures to that of the UPRM will vary widely. Some states will incur significant costs in adopting the guidelines, while others may not. As each state assesses its position relative to the Uniformity Guidelines and makes the decision to adopt or not adopt each guideline, it will need to factor in the necessary changeover costs of implementation. As a general rule, the larger the state's production base, the greater the cost of changing over. This changeover cost, while greater in absolute terms, will almost certainly be lower on a per-unit-of-production basis, since the larger states account for significant production volumes. Therefore, upgrading larger states will improve the data on proportionally larger volumes of total production.

Federal Participation is Required For Change

Federal assistance to the producing states is a necessity for change. Through such a partnership, the twin hurdles of insufficient state resources and lack of state inter-agency cooperation can be overcome.

Federal Funding Induces State Funding. State governments are under continuing budgetary pressure. Agency personnel queried during the project believed that state funded improvement of data systems was unlikely without significant federal assistance. In one state, state funding had been tentatively assigned, but was subsequently withdrawn due to budgetary pressures.

Federal Funding Induces Inter-Agency Cooperation. It is not uncommon for the relationships between the independent agencies to be strained, forestalling any attempt at standardization or data sharing. In some states, the incentive of federal co-funding may be the only inducement sufficient to encourage inter-agency cooperation.

Necessity for Critical Mass

Although change is only possible on a state-by-state basis, the true value of the UPRM can only be wrought by a broad-based multi-state implementation. For that reason, it is important that the federal government work closely with the producing states to devise a strategy for taking UPRM from the conceptual design stage through implementation.

Summary

Although the problems identified are not trivial, they are not insurmountable. The UPRM attempts to identify solutions to most of the major problems, and although not a panacea, it does contain solid, workable suggestions for addressing state concerns. The next section introduces the UPRM, its major components, and specific aspects of its recommendations.

SOLUTION: THE UNIFORM PRODUCTION REPORTING MODEL

Introduction

The original intent of the UPRM was to provide a high-level design of an idealized production reporting system. This high-level design is called the Conceptual Model and it contains various documents that describe, in a generalized way, the basic components of such an ideal system. This idealized system is intended for adoption *at the state level.* While the concepts embodied in UPRM are universal and the federal government might play an instrumental role in bringing it to fruition, it is the states who must adopt and live with the UPRM approach.

While developing the Conceptual Model, it became apparent that one component needed to be a "checklist" to document the most effective concepts used in production processing, and therefore to identify those elements which would be instrumental in the promotion of production data uniformity. This need gave rise to the development of the Uniformity Guidelines. These guidelines were incorporated into the UPRM Conceptual Model, and began serving as a primary focal point of the model.

Conceptual Model

The UPRM Conceptual Model is a collection of documents that describe an idealized production processing system. It is, by definition, high-level and not suitable as a basis for detailed systems design and installation. However, it can be used as a first-cut approximation of a system, or as a framework for a more rigorous detailed systems design. The model is intended to convey the major functions and features of a production processing system and presents sufficient detail for this purpose. The following sections present a description of each of the major sections contained in the model. The actual Conceptual Model design documents are located in Appendix A.

> ***Business Events*** are discrete points in a well's life at which some action must or can occur. Example events include: filing for the initial permit to drill, unitizing a field, and permitting to abandon a well. Twenty major business events in a well's life have been identified and documented in this section. As mentioned in the Section IV Methodology, these business events were part of the Investigation Framework and were crucial in the development of the model. Each business event is documented in Appendix A with the following pieces of documentation:

- An **event description** describes the event, the critical assumptions, and the appropriate Uniformity Guidelines that pertain to the event.
- An **event flow** illustrates the major steps, the relevant system functions and conceptual data stores, and the important business entities involved, in an overall logical flow.
- An **event/function** matrix cross-references the specific steps of the business event with the major system functions.

Uniformity Guidelines. This section itemizes each Uniformity Guideline, identifying its purpose, options, and relevant discussion points. Given the importance of these guidelines to the overall model, they are described in further detail in the coming pages.

System Functions. This section describes the major system functions found in the idealized production system. It documents each function, explains its characteristics, and lists its major inputs and outputs. Examples include Permitting, External Data Sharing, and Data Capture and Validation.

Note that the Business Event section focuses on the business cycle and flow of events. The System Function section has a systems focus. The two are necessarily related in that a specific business event may require one or more system functions in order to complete the event.

Also note that both business events and system functions have been classified as either ***core*** or ***non-core*** for purposes of the UPRM.

- ***Core*** events or functions are those that are directly related to the processing of production-related information.
- ***Non-core*** events or functions are those that are *not* directly related to the processing of production-related information.

Conceptual Data Stores. Conceptual Data Stores provide a high-level description of the types of databases that will be necessary to support the system.

Entity-Relationship Data Model. The Entity Relationship Data Model outlines the business entities involved (such as companies, wells, transaction points, etc.) in the petroleum industry and their relationships with one another. The names and specific attributes of the business entities were documented to provide a general approach for capturing information about the major entities and their relationships. Specific terminology may vary from state-to-state.

Uniformity Guidelines

As the business events were designed and documented, the Uniformity Guidelines evolved as specific recommendations for making the processing of gas and oil production-related data more uniform. The guidelines were developed as representations of the best practices of all of the state agencies solicited. In fact, most of these guidelines are followed by at least one of these agencies.

The Uniformity Guidelines were developed to be guidelines only - ***not mandates*** - and have the following characteristics:

- No recommendations are made regarding *who* is responsible for implementing the guidelines.
- The guidelines are broad strategic approaches to achieving uniformity. Specific standards are recommended when they appear to be fairly stable and widespread.
- The guidelines are directly related to the processing of volume and/or value information through state systems. Note that the establishment and maintenance of critical reference data, as well as the processing of transaction data, is included in this scope.
- The guidelines are designed to be flexible. Acknowledgment is made that it might be unlikely for any single state to adopt *all* of the guidelines, that some states might opt for partial adoption of some of the guidelines, and that different states might elect to adopt different guidelines.
- Despite the underlying goal of flexibility, some of the assumptions in the guidelines are fundamental to the overall model. In the model, the well completion is defined as the lowest common denominator from which all entity relationships are built. While in some cases the well bore might serve this function, the model is based on the capturing of essential reference data at the lowest possible level. The identification of the well completion, or well bore, has to be captured in order to link to data at other levels.

The following overview presents a high-level introduction to the Uniformity Guidelines. There are 60 detailed guidelines and each is discussed thoroughly in Appendix A.

Reference and Relationship

The goal of these guidelines is to establish and maintain basic reference and relationship information that will support the processing of production data. Some of these guidelines are focused on maximizing the uniformity of the data across states (e.g., the use of an API well bore number), while others are intended to support cross-agency verification of volumes (e.g., wells are linked to tax groups).

Timing and Content

These guidelines focus on the specific flows of data into and out of state agencies. The majority of these guidelines focus on increasing the timeliness of data (e.g., specifying the maximum time lag between the end of production and the due-date of reporting). Others, however, are focused on increasing the consistency of the data (e.g., specifying the products to be reported on a well test).

Communication

These guidelines are designed to take advantage of existing telecommunications standards for sending and receiving data. Appropriate standards are identified here and recommended for more widespread use in the UPRM.

Validation and Verification

These guidelines focus specifically on increasing the accuracy of the production data. They provide specific recommendations for validating data within a single agency, and then verifying that data within a single agency. Finally, there are guidelines for cross-agency verification of the data. Note that these guidelines depend heavily on guidelines established in Reference and Relationship in that cross-agency verification of data relies on comprehensive reference data. For example, to cross-agency verify volumes between the conservation agency (which receives production data at the well level) and the tax agency (which receives information at the tax group level), there must be a solid link between wells and tax groups that can be used for comparing volumes.

External Data Sharing

These guidelines ensure that external users will have meaningful access to the data. These guidelines lay out specific recommendations regarding the types of data that are available and the formats by which users can access that data. They provide for consistent access methods for data users across producing states.

Other Aspects of the Uniformity Guidelines

The Uniformity Guidelines are specific recommendations that maximize the quality and uniformity of production-related data on a national basis. The development of this list of guidelines involved a continuous review of each guideline relative to the original objectives for the project. Those objectives were:

- Increase ***timeliness,***
- Increase ***accuracy,***
- Increase ***consistency,*** and
- Increase ***accessibility.***

In order to be accepted as part of the UPRM, each guideline was required to improve the overall quality of the data in one or more of these ways. Many, however provided additional benefits that do not fall into any specific category. The following discussion points summarize some of these other benefits of the guidelines.

Data are Available Across Agencies

In order to cross-agency verify data, there must be an underlying shared set of data. The Uniformity Guidelines specify what kinds of data should be shared across the agencies in order to make this process effective. It is important to note, however, that once users in each agency grow accustomed to sharing the specified data, they will find more opportunities to share data with one another. This continuous process will certainly increase the effectiveness of all three agencies.

Multiple Levels of Data Quality

The Uniformity Guidelines recognize the varying levels in the quality of production data over time. As a general rule, the quality of data increases over time. The Uniformity Guidelines define the following levels of data screening to ensure that the highest quality data is available at each point along the process:

Data Validation. This screen is applied upon initial receipt from the reporting entity. Any data not passing this initial screening is not accepted into the system and is therefore not available to the general public. To pass this type of screening, data must be free of gross errors such as:

- Invalid well number or company number,
- Invalid date (e.g., 3/32/93), and
- Invalid volumes (e.g., non-numeric production volumes).

Data Verification. This screen is applied by the receiving agency. To pass this type of screening, data must pass fundamental checks such as:

- Historical validity checks (e.g., if a well normally produces 1 mcf per day, and is suddenly reported as 1,000 MCF per day), and
- Sub-total checks such that the total reported volumes equals the sum of the detail reported volumes.

Note that data that has passed validation is available for public review, but that if significant errors are discovered during the data verification process, these errors should be highlighted to the public. This is done so that data users can make adjustments for incomplete or erroneous data.

Cross-Agency Verification. This level of screening is applied by two or more primary agencies. This type of screening is more subtle than the previous two in that the basic data have passed fundamental error checks. In this step, deviations in reported data between agencies are caught. For example:

- The sales value for gas is reported as $1.50 to the tax agency. The sales value for gas is reported as $1.25 to the royalty agency. This level of verification would flag the discrepancy for analyst review and follow-up.

Note that for this type of verification some error tolerances might be required. If the bases for volume or value reporting differ on the two reports (e.g., they are reported from different transaction points in the system), the error checks will have to allow some level of differences. Nonetheless, this process will be instrumental in identifying systematic errors and will aid significantly in the efficient identification of audit candidates.

Most states now perform basic data validation using information systems, while some perform data verification this way. Very few, though, have the level of sophistication required to perform cross-agency verification. This factor limits state verification processes to those that can be performed manually, mainly through audits.

Standard EDI Communications are Encouraged

Electronic data interchange (EDI) is an emerging technology that not only eliminates the need for manual data entry but also provides standard formats for the transmission of data transactions. Additionally, the acknowledgment of receipt of data and the ability to transmit error transactions back to the source will facilitate timely and accurate reporting of the data.

Reporting Time Limits are Standardized

The Timing and Content guidelines propose time limits for reporting production-related data. These time limits will certainly help increase the timeliness of the data, but they will also help standardize reporting requirements on an industry-wide basis.

Manual Processing of Information is Minimized

The introduction of guidelines involving electronic data interchange (EDI) and cross-agency verification of data assumes that much of the processing of information is handled electronically. By adopting guidelines such as these, states can re-direct state employees from low-value-added manual activities and allow them to focus on more pressing issues.

IMPLEMENTATION

Introduction

Development of the Conceptual Model was the first task for the UPRM project team. The second major task involved determining the order-of-magnitude requirements for implementing that model across producing states. This section discusses these requirements and the methodology used to derive them. In addition, a section is included that outlines some basic considerations for any state beginning an implementation of the UPRM.

Requirements

Methodology

The basic methodology for determining the requirements for implementing the UPRM can be summarized in three steps:

1. Determine the approximate cost requirements for a hypothetical state.
2. Validate the requirements for this hypothetical state against the actual costs of a comparable state (New Mexico) with recent experience in a similar undertaking.
3. Extrapolate the costs of the hypothetical state to the remaining producing states on some quantitative basis.

Implementation requirements were defined for the following major components of the cost of a system installation:

- Hardware/system software
- Labor (both state and external labor)

Appendix B presents a detailed description of each of these steps and the assumptions made in developing the estimates.

Summary

The requirements for implementing the UPRM will vary from state-to-state, depending on the size of the gas and oil reporting activity within the state, among other factors. For this approximation, producing states were categorized into seven tiers based on the number of producing wells in each state. State size will impact system design and development costs to some degree, and will impact data conversion costs to a greater degree. (For example, significantly more effort will be required to link wells to tax groups in larger states.) The tier breakdown for producing states is as follows.

TIER	STATES	AVERAGE # OF WELLS
Tier 1	Texas	236,468
Tier 2	Oklahoma	129,654
Tier 3	Kansas - Ohio - Pennsylvania - West Virginia	59,476
Tier 4	California - Illinois - Kentucky - Louisiana - New Mexico	37,797
Tier 5	Arkansas - Colorado - Indiana - Michigan - Montana - New York - Wyoming	9,887
Tier 6	Alabama - Alaska - Mississippi - Nebraska - North Dakota - Tennessee - Utah	2,646
Tier 7	Arizona - Florida - Maryland - Missouri - Nevada - Oregon - South Dakota	270

Larger Tier 1 and 2 states will require significantly more effort to adopt the guidelines on an absolute basis, but will provide the greatest return on a per-well or per-volume basis.

While Appendix B describes the approximation methodology in detail, the following summarizes the major points.

Labor Requirements. Labor requirements were estimated for a hypothetical state implementation and were adjusted for states by tier. These estimates included efforts required for detailed analysis and design, programming, testing, data conversion and training. The requirements range from:

- 330 work-days per state for the smallest Tier 7 states to;
- 19,000 work-days per state for middle range (Tier 4) states to;
- 32,000 work-days for the Tier 1 state.

Labor Costs. Using the following assumptions, the labor requirements presented above can be converted into costs:

- Assume that 20% of the total work is performed by state employees, with the balance being performed by external labor.
- Assume that state labor costs $250 per day. This includes salary, benefits, holidays, and overhead.
- Assume that external labor costs $1,000 per day. This includes hourly fees, travel expenses, and housing expenses.

Using these assumptions, the labor costs range from:

- $290,000 per state for the Tier 7 states to;
- $16 million per state for the Tier 4 states to;
- $27 million for the Tier 1 state.

Hardware/System Software Costs. These costs range from:

- $10,000 per state for the Tier 7 states to;
- $1.5 million per state for the Tier 4 states to;
- $6 million for the Tier 1 state.

TOTAL COSTS. Range from:

- $300,000 per state for Tier 7 states to;
- $17 million per state for Tier 4 states to;
- $33 million for the Tier 1 state.

While Appendix B contains an exhaustive list of assumptions and disclaimers, the following major points deserve special mention here:

- The costs assume a complete development of core functionality as discussed in the UPRM Conceptual Model.
- **The total costs presented here do not include costs for industry to respond to the new reporting requirements by states in the implementation of the UPRM.**
- Only costs to state and federal governments are approximated.
- No assumption is made regarding the source of the funding.
- No assumption is made regarding the timing of the implementation.

Discussion

The costs calculated in this model are approximate costs for a full implementation of all sixty guidelines of the UPRM. The actual costs of implementation may be **lower than estimated** due to any combination of the following reasons:

- Some states will choose not to adopt the UPRM guidelines.
- Some states have already adopted some or all of the guidelines.
- Some states will adopt only limited subsets of the guidelines.
- Some states could combine their efforts to achieve system development efficiencies.

- The approaches taken by some states will be modifications of the basic assumptions used to approximate costs.

To arrive at more precise cost totals will require more detailed analysis and planning activities than could be accomplished within the scope of this conceptual model project. Individual states will need to assess their own situations and determine their own implementation parameters and strategies before they can derive realistic expected costs. This activity should be supported in the next "phase" of the state upgrade program. Once several of these state assessments have been completed, cost estimates based on the needs of real states, rather than a hypothetical state, can be derived for the extended implementation of the model.

To illustrate this point, assume that two pilot states are identified for detail design activities, and that these two states are from Tier 2 and Tier 5. According to the assumptions made in this implementation model, the total cost for the two states would be approximately $32 million dollars, which with a 50/50 cost sharing ratio would be a total cost of about $16 million in federal dollars. As an outgrowth of the "Phase 2" efforts, actual cost calculations for these two pilot states could then become a source for validating project cost estimates for the remaining states, testing some of the assumptions built into this approximation, and identifying further opportunities for cost savings.

Regardless of the degree to which actual costs will match the estimates within this model, implementation costs will be significant. However, for many states the expected returns on the investment will be even more remarkable. For example, in the state of Oklahoma estimates of under-reported production have ranged from as little as 3 percent to as much as 10 percent. If improved reporting systems result in only a 1 percent increase in natural gas production reporting, the state will gain over $2.5 million per year in state revenues. Within a few years, the system will have paid for itself through increased tax and royalty revenues alone.

Again, Appendix B provides extensive detail regarding the methodology, assumptions, disclaimers, and estimates of this implementation model.

Considerations

The decision to go forward with the implementation of any new system opens the door to many more decisions or considerations. These considerations will increase in number with the complexity of the project and will deserve special attention. The following sections present a list of identified considerations that many states will face as they proceed with the implementation of a system based on the UPRM guidelines.

Scope of Interaction Between Agencies

The process of adopting the UPRM will provide a forum for states to consider organizational changes within the primary agencies as part of the implementation. As the implementation moves forward, these changes could range from a integration of the agencies, to the development of a special "data handling" group, to the simple sharing of databases. Most states will probably choose a route of developing shared systems and data among the three agencies while still retaining individual agency autonomy. Several key areas should be considered in moving forward through this implementation, including statutory requirements, utilization of resources (personnel, computing equipment, and space), and organizational structures.

Management of Change

Many of the concepts embodied in the UPRM are fundamentally different from today's practices. Moving from current systems and procedures to those based on UPRM will require significant change on the part of the organizations involved. The management of this change will be crucial for the successful implementation of a new system. The level of pro-active management will obviously depend on the level of change anticipated by a particular organization. The following points should be considered, however, regardless of the level of change.

Internal Management of Change. Employees will need to understand the new direction, the new goals of the organization, and the new approach to systems and procedures. Effective communication and training will be crucial.

Between State Agencies and Industry. Any significant change that is undertaken by the primary agencies will have impacts on industry. As mentioned before, industry should obviously be involved in the design and implementation of the new system, but special plans need to be made for providing status and direction information to those industry players not directly involved in the effort. In addition, training sessions should be instituted for the appropriate industry participants who must be responsive to the changes being implemented.

States' Selection of Appropriate Uniformity Guidelines

Not all Uniformity Guidelines will be appropriate or practical for implementation in all states. Most guidelines should be appropriate and practical for most states however. Each state will need to decide which guidelines are appropriate for implementation and will need to take into account the impacts of this implementation.

For example, guideline impacts on marginal wells might require special consideration. Many producing wells are nearing the end of their economic lives and are especially sensitive to increases in administrative expenses. As administrative costs increase, they consume a greater portion of the revenue stream, leaving continually smaller profits for well owners. This is especially important when taken together with the natural decline in production that necessarily causes a decline in gross revenue. Each guideline should be evaluated as part of an overall cost/benefit analysis to assess its impact on these wells to ensure that sufficient value is gained from implementation, and to ensure that the guideline does not shorten the effective economic life of a significant number of wells.

Information Systems Issues

Fundamental choices must be made when pursuing the development of a UPRM-based system. The following major aspects must be addressed early in the effort.

Mainframe vs. Mini vs. Client/Server or other PC-based System. One of the first choices to be made by each state involves the selection of a hardware strategy. This choice will need to take into account the long-term direction of the agencies, the relative amount of power required, the available budget, etc. While some larger states may still use mainframe technology for most applications, plummeting hardware costs may make the change to a less expensive solution more appealing.

Custom vs. Packaged Software. Another choice involves the selection of the approach for application software. Application software is normally defined as the business software that assists personnel in doing their day-to-day jobs. Examples in this case would be Permitting, Allowables, and Data Capture and Validation routines. After selecting their basic hardware direction, states will need to decide whether they should buy existing software package(s) or develop new systems to meet their own needs. Some of the considerations to be taken into account include:

- The availability of third-party software packages
- The suitability or "fit" of third-party packages with state needs
- The level of on-going vendor software support that can be expected
- The overall stability and reliability of the vendor
- The cost of new development relative to the benefits of a custom solution

Statutory Issues

The adoption of some guidelines may require statutory changes in one or more agencies. This should be addressed and considered when deciding to implement a specific guideline, but once the decision is made, appropriate action should be taken to ensure that no statutory limitations are in-place that could prevent successful adoption of the guideline on a statewide basis.

Incentives For Compliance

One of the guiding principles of the UPRM effort involved focusing on incentives, not mandates. A philosophical tenet of the effort is cooperation between federal and state governments, as well between government and industry. All parties involved will ultimately benefit from a spirit of cooperation in addressing common concerns. Instead of relying on the usual set of mandates and penalties, state governments can accomplish many of the same objectives through the use of creative incentives. Incentives such as bond reduction or tax credits would provide industry with a vested interest in complying with state statutes.

Financing Considerations

Given the significant costs associated with implementing new systems, it is important that states consider many aspects of the financing of such an undertaking. In addition to soliciting assistance from the federal government, states might consider a number of other financing options, some of which are identified below.

Mechanisms For Recovery of Costs. States might consider some series of fee structures for the use of the new databases. Examples might include:

- Hourly charges for on-line access to the new data
- Charges for transmitting data via EDI
- Charges for sharing of data through other mechanisms (magnetic media, paper, CD-ROM)

Bond Issue Options. When soliciting funding, states might consider issuing bonds by one or more of the primary agencies. This approach assumes that this power is available and that the parties involved are interested in going forward. The issuance of bonds may provide a more consistent source of funding in that there are minimal year-to-year justifications required for this multi-year effort.

Small State Formation of a Co-op. Many of the smaller states might not be interested in developing their own custom systems. Such solutions may be inappropriate or uneconomical. In these cases, two or more small states might consider forming a co-op for the purposes of building new information systems. This approach might provide the economic incentive for the states to continue; whereas they might otherwise have chosen to not participate.

RECOMMENDATIONS

1. UPRM Should be Used as the Basis for DOE's State Upgrade Program.

In it's *1993 Domestic Natural Gas and Oil Initiative,* the DOE announces the establishment of the State Upgrade Program. Specifically:

- "In 1995 two or more States will join in cooperative demonstrations to upgrade their natural-gas-production reporting systems to be compatible with the University of Oklahoma model, with co-funding of hardware and software acquisitions by DOE." (Page 16)
- "Evaluation of the successful start-up of these initial systems will result in a plan for implementing similar reporting systems in other natural-gas-producing States. While the objective of this action is not to require absolutely identical reporting systems, we expect systems to be developed by 1996 which ensure compatibility among States." (Page 16)

The UPRM is ready to be adopted by DOE as the basis for this State Upgrade Program. As part of this adoption, steps need to be taken to begin further defining specific aspects of this program, especially given the relatively short time frame for implementation in the demonstration states. The following sections outline the major items which need to be addressed during DOE's further refinement of the State Upgrade Program.

Cost Sharing

The total budget for the State Upgrade Program needs to be identified and appropriated, ear-marking these funds for states eligible for assistance under the program.

Roll-Out Approach

DOE is fairly specific about its plans to identify two or more pilot states in 1995 for cooperative demonstrations. The next logical step is to begin working with and encouraging the candidate states for these demonstrations and begin developing specific implementation schedules. In addition, plans must be developed for the mechanism to be used in granting financial assistance to other states considering a systems upgrade.

2. *A State/Federal Partnership Should be Established To Ensure the Long-Term Success of the UPRM*

The delivery of this report signals the end of the UPRM feasibility study. The DOE is in a unique position to leverage the product of this study into truly uniform production data on a nationwide basis. This leveraging process must recognize that the model is just a beginning and needs to be further refined and updated to reflect new and more up-to-date input. For this reason, it is important that DOE form a partnership with the appropriate state and industry representatives to ensure that this model moves ahead to implementation.

Identification of the Model's "Owner"

The development of a model such as the UPRM is intensive and requires in-depth knowledge as well as continuous involvement by the relevant parties. For this reason, it is important that the model have an "owner". This entity will need to assume responsibility for the model's maintenance and interpretation from the UPRM project team. In addition to maintaining the model, that entity might provide valuable assistance to DOE as it evaluates applications for state assistance.

Definition of Output Data Standards

One of the key guidelines of the UPRM is that data can be communicated from the state agencies to external users in a consistent format. This guideline assumes that a standard format exists for this purpose. Developing such a format was beyond the scope of this feasibility study, and so at the conclusion of the project no such standard existed or was on the horizon. For that reason, a team should be assembled of appropriate experts who can define and document such a standard. That team could also be responsible for defining the standards for data quality statistics that are addressed in another data sharing guideline.

Continued Refinement of UPRM

Once an "owner" of the model has been established, that owner must continue to update the documentation based on new or more current information, such as the approval of new standards or conventions. This will be an on-going process and will require periodic reviews and working sessions by appropriate government and industry experts.

3. A UPRM Implementation Program Should Begin in Producing States

The model is just the beginning point for establishing nationally uniform production data. To take this effort from concept to reality will require that individual states begin implementing the concepts contained in the UPRM. The following points summarize the major tasks remaining for states that are interested in implementing the UPRM.

State Assessment of Interest

Each state must decide whether or not it is interested in pursuing production systems based on the UPRM concepts. This decision should be made carefully, after considering both the costs and benefits of an implementation.

Identification of Relevant Uniformity Guidelines. Each state will need to identify those guidelines that are relevant to its situation. Some guidelines, because of statutory or state-specific industry concerns, may not be appropriate for implementation in a particular state. Each state will need to identify only those that are relevant or partially relevant before proceeding to the next step.

Cost/Benefit Analysis. Once the relevant list of guidelines has been established, a thorough cost/benefit analysis will need to be performed that accounts for all appropriate costs and all expected benefits. This analysis should consider costs to the state and federal governments, as well as costs to industry. The results of this cost/benefit analysis will support state agency experts in their assessment of how to proceed.

Development of State/Industry Task Force

Assuming a state is interested, it should proceed with formalizing its strategic approach to the effort. Specific steps might include the identification of key industry players, since any statewide effort requiring significant change on the part of industry can best succeed if it seeks the advice and support of appropriate industry leaders. Close cooperation between state and industry can only enhance the quality of the solution for all concerned. Once the key industry representatives have been identified and the task force established, it is important that the scope of the task force's duties and its specific responsibilities be defined. Such definition will support the spirit of cooperation and will ensure success.

Solicitation of State Support

State-level support for an initiative of this nature will be crucial. The agency(ies) involved in this process should solicit the support of other agencies and key legislators.

Solicitation of Federal Assistance

Assuming DOE has funded the State Upgrade Program, it should have means for assisting states as they upgrade their systems. Appropriate steps should be taken to understand the process for obtaining these funds and this process should begin.

VI. CONCLUSION

CONCLUSION

Nationwide Implementation is Feasible

The original project charge was to investigate the feasibility of developing a conceptual model for nationwide use in gathering production data. Such an implementation is indeed possible, and many states are interested in adopting the guidelines outlined by the UPRM Conceptual Model. At the same time, states are under increasing budgetary pressure and will have little or no funding available for unilateral upgrades of state systems. For that reason, federal assistance to producing states will be essential for nationwide adoption of the UPRM.

Implementation is Urgent

A window of opportunity for natural gas to become a premier energy source in the United States is present today, but without decisive action, that window could close. The primary barrier to widespread use of natural gas is its perceived lack of supply reliability. This perceived lack of reliability is due mainly to the lack of timely and accurate production and deliverability information. Inadequate deliverability data and inadequate supply information can cause artificial price volatility; this can negatively impact producers' decisions to drill and to further expand the nation's resources into productive reserves. Since reserve increases will come only through increased drilling, the wide-spread implementation of a uniform production reporting system such as the UPRM improves resource supply planning, which increases opportunities for new drilling. Patchwork revamping of state systems may deplete available state funds without providing national benefits. Recurring themes surrounding the natural gas industry and production data can be summarized as follows:

- The natural gas is increasingly dependent upon timely and accurate production information.
- At the same time, producing state agencies are increasingly unable to provide that data.

These two problems share a common solution that centers on the implementation of nationally standard uniform production reporting.

Benefits of Implementation

The ultimate beneficiary of improved production data is the consumer of natural gas. Benefits will accrue through reduced price risk and increased availability of domestically abundant and environmentally benign natural gas.

Producing states will also benefit from the adoption of UPRM in that these states will have better control over gas and oil resources and will benefit from cross-agency sharing of data. The federal government will benefit from improved data for policy making and from increased royalties for managing public and Indian lands.

The nation will benefit from a stronger, more competitive gas industry. As consumer confidence grows, the demand for natural gas will increase, and the natural gas industry will expand. This will result in increased employment, increased research and development investments, increased conversion of the nation's domestic resources into productive reserves, and an overall positive impact on the nation's economy.

The Conceptual Model is Only the First Step

The UPRM is only the first step in the process of realizing the benefits of nationally uniform production data. It is now up to the state and federal governments to capitalize on the extensive knowledge captured through this effort. The UPRM initiative has required the close cooperation of representatives from state governments, industry, and the federal government. This cooperation will be essential for the long-term benefit of the consumer through nationally standard production data.

Finally, the DOE is in a unique position to build the required momentum to ensure the success of the UPRM. It can do this by adopting it as the basis of its State Upgrade Program that it introduced in *The 1993 Domestic Natural Gas and Oil Initiative*, Action 3.1 Upgrade State Data Collection and Reporting on Natural Gas Production.

LIST OF ACRONYMS AND ABBREVIATIONS

AGA	American Gas Association
API	American Petroleum Institute
ASC	Accredited Standards Committee
BLM	Bureau of Land Management
BOE	Barrel of Oil Equivalent
BTU	British Thermal Unit
COPAS	Council of Petroleum Accountants Societies
DoD	United State Department of Defense
DOE	United States Department of Energy
DTF	Deliverability Task Force
EBB	Electronic Bulletin Board
EDI	Electronic Data Interchange
EIA	Energy Information Administration
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
GIS	Geographical Information System
GISB	Gas Industry Standards Board
GPS	Global Positioning System
INGAA	Interstate Natural Gas Association of America
IOGCC	Interstate Oil and Gas Compact Commission
IPAA	Independent Petroleum Association of America
LDC	Local Distribution Company
MCF	Thousand Cubic Feet
MMS	Minerals Management Service
NARO	National Association of Royalty Owners
NARUC	National Association of Regulatory Utility Commissioners
NGSA	Natural Gas Supply Association
OIPA	Oklahoma Independent Petroleum Association
OU	University of Oklahoma
PIDX	Petroleum Information Data Exchange
PUC	Public Utility Commission
UPRM	Uniform Production Reporting Model
UTM	Universal Transverse Mercator