CHAPTER 2

Background and Introduction

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The Federal Government owns between 50 and 60 percent of the coal reserves west of the Mississippi River. Over 16 billion tons of these Federal reserves are currently under lease, * In 1979, coal production from leased Federal land was about 60 million tons. As Western coal production expands to meet new demand, the development of Federal leases will become increasingly important.

Since 1920, the Department of the Interior (DOI) has administered a leasing program that allows the private sector to mine coal on Federal lands, A lease grants to the lessee the exclusive right to mine coal subject to the terms of the lease and to State and Federal laws. Historically, leases have been issued by two methods; 1) competitively, to the highest bidder at a lease sale and 2) noncompetitively, through an application process called "preference right leasing, " to prospectors who discovered commercial coal reserves on Federal land, About half of all existing leases have been issued by each method. The Federal Coal Leasing Amendments Act of 1976 (FCLAA), which abolished the preference right system, requires competitive leasing of Federal coal.

In 1970, a Bureau of Land Management (BLM) study of the Federal coal leasing program found that from 1955 to 1970 the amount of coal under lease had increased sharply while the amount of production from Federal leases had declined. (See fig, 15 in ch. 3,) In response to this study, BLM imposed an informal moratorium in 1971 on the issuance of new leases. The purpose of this moratorium, which was made formal in February 1973, was to provide time to reassess Federal coal leasing policies. Over the next several years a number of issues were examined during BLM's reassessment of the size, timing, and location of new leasing.

Public concern and debates about these issues and about the structure and management of the leasing program led to congressional hearings and to passage of FCLAA (Public Law 94-377). Section 10 of this act directs the Office of Technology Assessment to conduct an independent review of existing Federal coal leases. Specifically, the act directs OTA to:

- analyze all mining activities on Federal coal leases;
- determine the present and potential value (production) of Federal coal leases;
- estimate the Federal receipts from lease rentals and royalties: and
- assess the feasibility of using deep-mining technology in leased areas.

To meet these requirements, OTA completed a comprehensive inventory of Federal coal leases, which identifies the location of each lease, its major geotechnical characteristics (e.g., amount and quality of coal, depth and thickness of the coal seams), and the business experience and capability of the lessee. After completing this inventory, OTA analyzed the development potential and production prospects of the 565 Federal coal leases in existence on September 30, 1980. * OTA estimated the mine design capacity and annual production that these leases could sustain from 1980 to 1991, considering the mining and reclamation conditions anticipated on the leases and the market conditions, environmental, transportation, legal, and institutional factors affecting their development. In addition, OTA analyzed the prospects for increasing coal recovery by underground methods on Federal leases and estimated the revenues from present and potential production.

*See ch. 4 anti table 7 for a discussion of the amount of Federal coal reserves in the West.

*The study does not examine unleased Federal coal or the leases issued in early 1981 as part of the new leasing program of the Department of the Interior.

Scope of the Assessment and Methodology

There are currently 565 Federal coal leases and over 170 pending preference right lease applications (PRLAs) in 14 States. This report focuses on the leases in Colorado, Montana, New Mexico, North Dakota, Oklahoma, Utah, and Wyoming. These seven States account for 97 percent of the existing leases and over 99 percent of the leased recoverable reserves (16.5 billion tons). OTA did not examine the development potential and production prospects of unleased Federal coal reserves, proposed new leasing tracts, or the small quantity of reserves under lease in Alabama, Alaska, California, Kentucky, Oregon, Pennsylvania, and Washington.

Coal leases in this report are classified according to their mine plan status on September 30, 1980. Submittal of a mine plan is an important milestone in lease development. DOI must approve a mine plan before a lessee can mine coal from Federal land. Each mine plan details the development plans of the lessee, includes technical information on the resource characteristics of the lease(s), and describes the proposed mining operation. Accordingly, OTA grouped the leases in three categories of development: 1) leases with approved mine plans; 2) leases with mine plans submitted and pending approval; and 3) leases with no submitted mine plan. Leases without mine plans are called “undeveloped” leases in this report.

Evaluation of the development potential and production prospects of existing Federal coal leases and PRLAs involved extensive data collection and analysis. Development and production of Federal coal will depend on a variety of property characteristics, including: 1) the quantity and quality of reserves, 2) the geological features of the coal deposits, 3) the size and configuration of the leases (coal leases vary from 40 acres to more than 20,000 acres and are often interspersed with non-Federal coal), and 4) environmental, mining, and reclamation conditions. The mining experience and capital resources of the lessee are also important to consider in estimating the development potential and production prospects of a lease. The production prospects of many Federal leases will also depend on other factors including the level of demand and location of markets for Western coal, the impacts of State and Federal policies and regulations, and the availability of transportation.

Information Sources

OTA obtained information from a variety of sources, including: 1) Federal and State government agencies; 2) special studies; and 3) interviews and special State task forces.

Federal and State Government Agencies

In addition to the mine plans submitted by the lessees and the lease records, two important sources of technical data used in this study, especially for the analysis of undeveloped leases, are the Automated Coal Lease Data System (ACLDS) and the information submitted by lessees under General Mining Order No. 1 (GMO No. 1).

ACLDS is a computer-based inventory of Federal coal leases and lease applications. The system is managed by BLM and is updated every 6 months. The purpose of ACLDS is to store in a readily accessible format a range of technical and administrative information on every existing lease. The system is still being developed and both the quality and amount of information vary among leases. The U.S. Geological Survey (USGS) is currently revising the reserve information for each lease in ACLDS, integrating the information on mining methods and conditions acquired by USGS officials and geophysical data from its files with data prepared under contract and with each lessee’s submittal under GMO No. 1.

GMO No. 1 establishes a standard procedure for estimating in-place, minable, and recoverable reserves. The order also requires the lessee to submit other information on a

lease such as overburden thickness, stripping ratio, and seam thickness according to uniform reporting criteria. GMO data are reviewed and processed in regional offices of USGS. Because there are differences in the interpretation of this data among USGS offices, the process of developing a uniform, comprehensive data base for Federal coal leases is still continuing. When GMO data were not available, OTA was often able to obtain information on coal reserves from the lessees themselves or from regional environmental impact statements (EISS), other published sources, or independent calculations.

Special Studies

In addition to reviewing numerous published and unpublished reports on Western coal development and Federal coal leasing, OTA conducted several special studies to support the assessment, These include:

- Ownership study, Analysis of ownership trends of Federal coal leases that identifies and classifies the types of business organizations that have acquired Federal coal reserves from 1950 to 1980.[1]
- PRLA study. Review of the history of preference right leasing, the location of existing PRLAs, and the ownership patterns and business organizations of the holders of PRLAs.
- Mine development study. Review of the major geotechnical and economic features of coal mining in the seven Western States covered in this assessment. "Mine profiles" are developed for each region.
- Market studies, Analysis of the likely markets for coal produced in Wyoming, Montana, Colorado, and Utah, and of the factors that are expected to affect demand for this coal in the 1980's.
- Synthetic fuels study. Analysis of the coal quality requirements an-d technical issues affecting potential development of coal-based synthetic fuels projects in the Western United States.

Interviews and Task Forces

OTA conducted personal and telephone interviews with representatives of coal companies, industry associations, Government agencies, and technical and policy specialists. OTA also convened five State task forces to assess the development potential of undeveloped Federal leases in Colorado, New Mexico, Oklahoma, Utah, and Wyoming and to review the factors affecting coal development in these States. These task forces brought together participants from Federal and State government agencies, industry, environmental groups, and the general technical community. * The results of task force deliberations contributed to the six OTA State reports, which assessed the development and production prospects of undeveloped leases and analyzed the factors affecting Federal coal development in each of the seven States.**

[1]This study has been published as an OTA Technical Memorandum, Patterns and Trends in Federal Coal Lease Ownership, 1950-80, OTA-TM-M-7, March 1981.

*A complete listing of the task force participants is at the front of this report.

**Six State reports were prepared. Reports on the undeveloped leases were prepared for: 1) Wyoming and Montana; 2) Colorado; and 3) Utah. Reports for North Dakota, Oklahoma, and New Mexico were also prepared, covering both developed and undeveloped leases. These reports will be available through the National Technical Information Service.

Analysis of Leases in Mine Plans

The primary source of information used to estimate potential production for leases in approved or pending mine plans was the mine plan itself.

Some of the important mine plan data reviewed by OTA include:

- quantity and quality of the reserves, total permitted and total disturbed acreage, seam thickness, and depth of overburden;
- mining and reclamation methods, permit requirements, and pending regulatory actions;
- mine design, anticipated resource recovery rates, peak capacity of the mine, and the lessee's estimated annual production from 1981 to 1990.

After reviewing this information, OTA prepared a summary of each mine plan that identifies the location, size, and type of the mining operation; the Federal leases, and the State and private lands in the mine plan or contiguous with or close to the mining area; surface ownership; and the quality and quantity of the coal reserves.

The summary also identifies the geological, environmental, and mining conditions that could potentially increase or decrease the recoverability of the coal reserves at the mine. The summary also considers the completeness of the mining plan, the status of geological exploration and monitoring activities completed at the site, and access to transportation networks.

The quality and amount of the information contained in the mine plans, and the range of issues they covered, vary considerably. Some of the mine plans exceed 20 volumes. Many provide a great deal of information on the environmental factors discussed in this report, especially those pertaining to reclamation. Comprehensive technical and environmental assessments prepared by the Office of Surface Mining (OSM), and technical and policy memoranda prepared by OSM and USGS during the mine plan review are also included in the official Government files on many of the larger mine plans, along with contractor reports and correspondence between lessees and Government officials. *

*A few leases in mine plans that were incomplete or inactive or submitted after August 1980 were included in the assessment of undeveloped leases.

Analysis of Undeveloped Leases

Nearly 45 percent of the existing Federal coal leases (249 leases) are not covered by approved or pending mine plans. For these undeveloped leases, detailed descriptions of the lessee's development plans are not readily available. State task forces were convened to assist in assessing the development potential and production prospects of these undeveloped leases. Task forces were held in Colorado, New Mexico, Oklahoma, Utah, and Wyoming.

Before each task force, OTA conducted a preliminary evaluation of the development potential of the undeveloped leases in the State. All adjoining undeveloped leases held by the same lessee and forming a compact and contiguous geographic unit were combined into a single lease block for purposes of analysis. The property characteristics of the lease blocks were then compared with a profile of economically viable mines in the State. (Mine profiles for average new mines were developed for each Western coal basin with Federal leases.) The following questions were asked in the comparison:

- Mining unit. Is the lease block compact, contiguous, and under single ownership

to allow for orderly development as a mining unit?

- *Coal reserves.* Are there enough recoverable coal reserves within the lease block to support a competitive new mining operation?
- Coal quality. Do the coal reserves meet minimum Btu, sulfur, and ash quality standards for the expected end use (e.g., electric power generation, industrial use, synthetic fuels)?
- *Geological characteristics.* Do the geological and topographical conditions of the coal reserves—such as depth of overburden, seam thickness, and dip—permit economic coal recovery?
- Ownership. Does the lessee have the financial capability and mining expertise to develop the lease block?

The task force members drew on their extensive experience and knowledge of local conditions to assess the influence of other factors on the development potential of the leases, including potential markets, geographic location, status of adjacent properties, surface resource values, transportation availability, community infrastructure, and environmental impacts. Following this review, OTA, with the assistance of the State task forces, classified the lease blocks as having:

- Favorable development potential.—The lease or lease block has favorable development characteristics overall; the lease(s) meet the threshold criteria for a viable mining property; there are no identified major technical or permitting problems or uncertainties associated with the lease development.
- Uncertain development potential.-The lease or lease block has uncertain development potential because development is contingent on factors such as transportation or synfuels development or because of lack of information about the lessee's development intentions. Property characteristics can be good or marginal.
- Unfavorable development potential.—The lease or lease block has unfavorable development potential, generally because it has one or more of the following property characteristics: small reserves, difficult mining or reclamation conditions, poor quality coal, or isolated location.

Finally, each State task force estimated the production prospects for all undeveloped leases with either uncertain or favorable development potential. The results of each task force were reviewed by OTA and supplemented with additional information where needed.

Analysis of Diligent Development

The **1920** Mineral Leasing Act originally provided that a Federal lease be issued for an indeterminant period of time, subject to the requirement that the lease be diligently developed. The act also included a clause requiring continuous operation after the lease was brought into production. Failure to abide by these conditions was grounds for cancellation of the lease. Between 1920 and 1970, however, the diligence requirements for Federal coal leases were not specifically defined. No lease was ever canceled because it failed to meet diligence. In **1976,** FCLAA removed the indeterminate term for Federal leases and required that new leases be canceled if they do not produce coal in commercial quantities within 10 years of issuance. Also in 1976, DOI issued regulations specifying that 2½ percent of the recoverable reserves on leases issued before the passage of FCLAA (pre-FCLAA leases) must be mined by June 1, 1986, to fulfill the terms of diligent development and that 1 percent of the recoverable reserves on leases issued after August 4,

1976 (post-FCLAA leases) must be mined 10 years after the date of issuance. Continuous operations requirements were also specified.

Under the 1976 regulations, the Secretary of the Interior can grant up to a 5-year extension of the 1986 deadline for pre-FCLAA leases. (Post-FCLAA leases are not eligible for this 5-year extension.) The grounds for granting an extension are: 1) time needed to complete the development of an advanced technology such as synthetic fuels, 2) time needed because of the magnitude of the project such as a large mine, or 3) a contract for sale of the first 2½ percent of the lease reserves after 1986. In addition to the above reasons, lease terms can be suspended because of delays in meeting the diligence requirements that are beyond the control of the lessee (e.g., accidents, strikes, or administrative delays). Poor market conditions do not constitute grounds for suspending the lease terms or extending the deadline for diligence.

In light of the diligence requirements promulgated in the 1976 regulations, 2 years are particularly important in OTA's analysis of Federal coal development: 1986 when leases issued prior to August 4, 1976, must meet the diligent production requirement of 2½ percent of the recoverable reserves, and 1991 when those pre-FCLAA leases that have been granted a 5-year extension must produce 2½ percent of the recoverable reserves. OTA analyzed its estimates of future production from Federal coal leases to determine how many leases are likely to meet diligence by 1986 or by 1991. *

Patterns of coal ownership in the West are not always consistent with the most efficient and economical mine design. Often a mine will include coal that is owned by the Federal Government, by a State Government, or by a private party. In recognition of this possibility and to promote the economical and efficient development of Federal coal leases, the concept of logical mining unit (LMU) was included in FCLAA and the 1976 regulations. An LMU is defined in the FCLAA as "an area of coal land that can be developed and mined in an efficient, economical and orderly manner with due regard for the conservation of coal reserves and other resources." According to the regulations, no LMU may be larger than 25,000 acres. All areas within an LMU must be contiguous and under the control of a single operator.

LMU is an important concept in this report because it defines the physical boundaries within which recoverable reserves are identified for diligence requirements. By regulation, BLM has defined every lease as an LMU whether or not it meets the statutory LMU description. Therefore, unless a lessee requests that a lease be included in an LMU with other Federal leases or non-Federal coal, the recoverable reserves on a lease will establish the reserve base on which diligent production requirements will be calculated.

In cases where a lease is included in an LMU with other Federal leases or non-Federal coal, compliance with diligent development and continued operations requirements will be calculated on the total recoverable reserves in the LMU, not just the Federal reserves. Consequently, a Federal lease in an LMU with non-Federal coal could meet diligence requirements before any Federal coal is mined, and in any year could fulfill continuous operations requirements even if no coal were mined from the lease itself. Under certain circumstances a lessee may petition to relinquish certain areas of the lease or certain seams or beds, in order to lower the recoverable reserves so that diligent development can be achieved.

*Of the 565 Federal coal leases in existence as of Sept. 30, 1980, less than 40 are post-FCLAA leases. Almost all of these post-FCLAA leases are associated with active mines and will meet diligence by or before their due date as part of the larger mining operation.

Uncertainties in the Analysis

OTA's analysis draws on extensive geological, technical, and market data, and informed judgments about the development potential and production prospects of Federal coal leases made by OTA and the OTA task forces on the basis of these data. Many of these judgments were reviewed by the lessees and by technical specialists. Nevertheless, uncertainties remain in the analysis both of leases in mine plans and of undeveloped leases.

Many undeveloped leases with good property characteristics, with owners actively developing the property, and with markets identified and, in some cases, with signed contracts are likely to be producing coal in the next 10 years. There is little uncertainty in ranking many of these leases as having favorable development potential and production prospects.

Many of the undeveloped leases classified as having unfavorable development potential have poor property characteristics compared to mines currently operating in the area and would be expensive to bring into production. Small reserves, poor coal quality, difficult mining and reclamation conditions, or combinations of several of these factors mean that there is little uncertainty in classifying these leases as having unfavorable development potential. However, even for some of the undeveloped leases with poor property characteristics, the lessee might be able to integrate the lease into an operating or planned mine or develop the lease for synthetic fuels production. Consequently, several undeveloped leases with poor property characteristics have favorable or uncertain development potential.

The development potential of many other undeveloped leases was clouded by uncertainties, In several cases, lease development was dependent on factors such as a favorable climate for synfuels or the construction of a new transportation facility.

Markets and the demand for Western coal over the next 10 years were particularly important considerations for those undeveloped leases with favorable or uncertain development potential. Coal production in the West during this period will likely be demand driven. OTA assessed the potential demand for coal from States with major Federal coal reserves. However, demand projections for Western coal are subject to numerous uncertainties, ranging from the rate of increase of electricity demand to the amount of coal to be exported to foreign countries. Moreover, even if demand for Western coal could be accurately and precisely forecast, predicting the success of a given lessee in capturing a share of this demand would still be subject to uncertainty. In the buyer's market that is likely for Western coal in the next 10 years, there will be strong competition for new sales, including competition from non-Federal coal mines in the West, from new Federal leases, and from coal produced in other regions. A number of factors, but especially the marketing success of the lessee, will ultimately decide whether or not a given undeveloped lease is brought into production and at what level. Even for those leases in approved mine plans with definite production goals and in many cases with contracts, the amount of coal that will be mined annually over the next 10 years is subject to uncertainty.

Thus, the estimates of potential production from Federal leases made in this report are not forecasts of the coal that would be produced at a given price or a given demand. They are estimates of the total amount of coal that could be produced from operating and proposed Federal mines and from those undeveloped Federal leases that have characteristics comparable to operating mines in the same region. Coal from these leases would thus be likely to have mining costs competitive with costs at currently operating mines in the same area. If the demand for Federal coal does not increase to these levels of potential

production, then not all the Federal leases that could technically and economically be developed will be brought into production. Moreover, although OTA based its evaluations of likelihood of development and levels of potential production on the best data available for each lease or mine at the time, as additional information based on further exploration and development becomes available, the prospects for any given lease or mine could change.

Estimating production from Federal leases was complicated by the fact that many coal operations in the West include Federal, State, or private (fee] coal. This pattern is most pro nounced in southern Wyoming, the Colstrip area of the Montana portion of the Powder River basin, and in North Dakota. For North Dakota, Wyoming, and Montana, OTA has estimated what fraction of the annual production of mines with Federal leases is likely to be from Federal reserves. In many cases, the geological characteristics of the mine and the direction of mining operations are such that little variation occurs from year to year in the ratio of Federal to non-Federal production; in other cases, however, large changes in this ratio will occur over several years. Wherever possible, OTA followed the judgments of the lessee's mine plan.

In any work that evaluates a large number of units, random statistical errors and changes tend to cancel one another. While events could prove OTA's estimates of lease development wrong in a number of individual cases, taken in the aggregate by region or State, the estimates presented in this report should constitute a reasonably accurate picture of Federal coal development over the next decade.

Focus of Subsequent Chapters

Chapters 5, 6, and 7 present OTA's findings concerning the development potential and production prospects of Federal coal leases. Chapter 5 identifies the factors that are likely to affect the markets for Western coal over the next 10 years and reviews the demand projections for Western coal that have been developed and considered by industry and Government. Chapter 6 presents the findings of the assessment on the amount of Federal coal that is likely to be produced over the next 10 years and the number of leases likely to fulfill diligence requirements. Chapter 7 is a case study of Federal coal development and production in the Powder River Basin of Wyoming and Montana.

Chapters 3, 4, and 13 review the status, distribution, geotechnical characteristics, and ownership of existing Federal coal leases, Federal coal reserves, and PRLAs. Chapters 8, 10, and 12 examine the impacts on Federal coal development and production resulting from transportation availability and costs, environmental statutes and regulations, and socioeconomic factors. Chapter 12 also presents OTA's estimate of revenues from rentals and royalties from Federal coal production over the next decade. Chapter 9 provides an overview of Federal coal lease management issues, and chapter 11 presents OTA's analysis of the feasibility of increasing Federal coal recovery through underground mining methods.