

## **Chapter 7**

# **The Powder River Basin “A Case Study”**

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# The Powder River Basin: A Case Study

As the preceding chapter has shown, the Powder River basin of Wyoming and Montana contains the largest pool of undeveloped leased Federal coal reserves with favorable development potential in the United States. Furthermore, the production of Federal reserves from the Powder River basin now accounts for about half of all Federal coal production in the country. Because of the important role of this region in Federal coal production, this chapter examines the Powder River basin in more detail. The chapter includes a mine-by-mine examination of the

Federal reserves scheduled to be produced over the next 10 years from currently operating or permitted mines, an analysis of the production prospects of each undeveloped lease and preference right lease application (PRLA) in this region, a discussion of the role of non-Federal mines in Powder River basin coal production, a consideration of demand for Powder River basin coal in the post-1990 period, and an examination of the different points of view on the large-scale new leasing of Federal coal scheduled for the Powder River basin in 1982.

## Two Demand Scenarios for the Powder River Basin

In order to evaluate the production prospects of Federal leases in the Powder River basin, it is necessary to identify the likely demand for Powder River basin coal over the next 10 years. In this analysis, OTA used a high demand scenario and a low demand scenario developed for the Powder River basin case study. This section considers a range of demand forecasts for Powder River basin coal, arrives at a "most likely range" of demand for 1985 and 1990, and examines the assumptions about high and low demand used in the analysis of Federal coal production prospects in this chapter.

Figure 34 summarizes several recent demand forecasts for Powder River basin coal for 1985 and 1990.<sup>1</sup> The Department of Energy (DOE) and ICF, Inc.'s CEUM (Coal Elec-

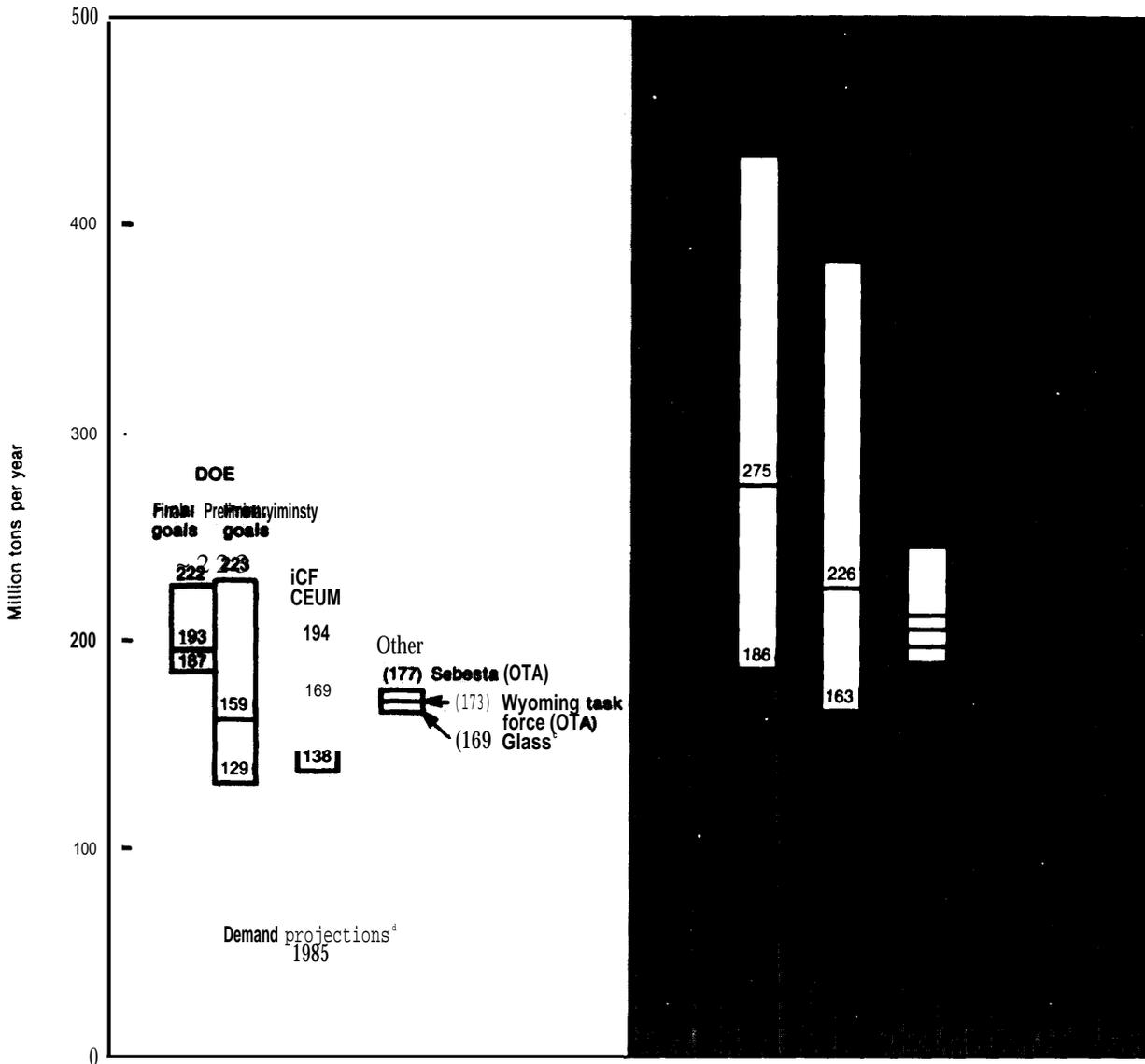
tric Utility Model) use basically the same computer model but vary a number of input assumptions (e.g., the overall growth rate of electricity demand in the United States) to arrive at three projections each for 1985 and 1990: low, midlevel (or base), and high. The Silverman forecasts (made for 1990 but not for 1985) are computer projections based on a series of different assumptions about electric demand in the market area for Northern Great Plains coal, the share of that demand to be met by coal, and the fraction of that share to be met by Northern Great Plains coal. The Sebesta and Glass projections are each based on a detailed examination of utility plans and

<sup>1</sup>These demand forecasts are:

1. DOE: Preliminary National and Regional Coal Production Goals for 1985, 1990, and 1995 [Washington, D. C.: DOE, Aug. 7, 1980.] See also: Analysis and Critique of the Department of Energy's August 7, 1980 Report Entitled: "Preliminary National and Regional Coal Production Goals for 1985, 1990, and 1995. prepared for the Rocky Mountain Energy Co. (Washington, D. C.: ICF Inc., October 1980).
2. DOE: The 1980 Biennial Update of National and Regional coal Production Goals for 1985, 1990, and 1995 (Washington D. C.: DOE, January 1981.)

3. ICF CEUM: Forecasts and Sensitivity Analyses of Western Coal Production, prepared for Rocky Mountain Energy Co. (Washington, D. C.: ICF, Inc., November 1980).
4. Sebesta: Demand for Wyoming Coal 1980-1991 Based Upon Projected Utility Coal Market and Demand for Montana Coal 1980-1991 Based Upon Projected Utility Market (Washington, D. C.: OTA, October 1980).
5. Wyoming task force: Result of deliberations of the OTA Wyoming task force: Cheyenne, Wyo., October 1980).
6. Glass: Wyoming Coal Production and Summary of Coal Contracts (Laramie, Wyo.: Wyoming Geological Survey, 1980).
7. Silverman: Preliminary Results from A. Silverman. University of Montana, Missoula. Private communication to OTA. Work is funded by OSM.

Figure 34.—Powder River Basin Demand Projections<sup>3</sup>



<sup>3</sup>See footnote on p. 169 for citations.

<sup>4</sup>Calculated by adding Sebesta's figure for the Montana portion of the Powder River basin (66 mmt/yr) to Glass' figure for the Wyoming portion (133 mmt/yr).

<sup>5</sup>Calculated by adding Sebesta's figure for the Montana portion of the Powder River basin (49 mmt/yr) to Glass' figure for the Wyoming portion (120 mmt/yr).

<sup>6</sup>For 1965 all projections assume zero demand for synfuels and for export to foreign countries from the Powder River basin. For 1990, see the text for a discussion of synfuels and foreign export demand.

contracts in the Powder River basin market area. The Wyoming task force estimate was reached after a review of the DOE, Sebesta, and Glass projections. Figure 34 also shows

the DOE final production goals. The DOE final production goals and their relation to the preliminary DOE projections and to other demand forecasts are discussed in chapter 5.

## Demand Projections for 1985

For 1985, demand projections range from 129 million tons per year (the DOE low) to 223 million tons per year (the DOE high). ICF projections range from 138 million tons per year to 194 million tons per year; these figures assume that there will be zero demand for Powder River basin coal for synfuels or for export to foreign countries.

Although the demand projections for 1985 span a wide range, they cluster in a much narrower range. The range of 138 million tons per year to 177 million tons per year includes the ICF low, the DOE preliminary and ICF mid, and the Glass, Sebesta, and Wyoming task force projections. This range excludes only the ICF and DOE preliminary low and high projections and the DOE final production goals.

Two other projections, not shown on figure 34, were also examined: the National Electric Reliability Council (NERC)<sup>2</sup> projections for total U.S. utility\* coal requirements and the long-term forecast of the National Coal Association (NCA).<sup>3</sup> NERC arrives at an electrical demand growth rate of 3.7 percent annually and a total domestic steam coal requirement of 684 million tons in 1985. NCA assumes an electrical demand growth rate of 3.5 percent annually and projects total domestic steam coal demand in 1985 of 727 million tons in its midlevel projection. By comparison, ICF assumes an electrical demand growth rate of 3.5 percent annually; its midlevel projection is for 717 million tons of total domestic steam coal demand in 1985.

<sup>2</sup>Electric Power Supply and Demand, 1981-1990 for the Regional Reliability Councils of NERC: National Electric Reliability Council: July 1981. The NERC figures do not explicitly project demand for Powder River basin coal and must be interpreted using assumptions about the extent of the Powder River basin market area and the market share of Powder River basin coal within the assumed market area. Therefore, NERC projections are not shown in figure 34.

\*Because 95 percent of Powder River basin coal is purchased by utilities, total utility demand is a good measure of demand for Powder River basin coal in 1985.

<sup>3</sup>National Coal Association, NCA Long Term Forecast (Washington, D. C.: NCA, March 1981).

In the NERC projections, the anticipated demand in 1985 for Western steam coal (excluding lignite) in the market area for Powder River basin coal is about 205 million tons. However, other coal competes in this market area (see fig. 20). Assuming that the Powder River basin share of this market in 1985 is the same as in 1979, i.e., 65 percent, and that 95 percent of the Powder River basin coal will continue to go to the utility market, the NERC figures lead to a demand estimate of 140 million tons in 1985 for Powder River basin coal. However, Powder River basin coal could capture a larger share of Western steam coal demand in its market area in 1985 than in 1979,

## OTA High and Low Demand Scenarios: 1985

OTA selected the Sebesta projection of 177 million tons per year for its high demand scenario for 1985. The Sebesta projection exceeds both the DOE preliminary and ICF midlevel projections, the NERC projections as interpreted above, and the projections of the Wyoming State Geological Survey (Glass, 1980). The Wyoming task force estimated 1985 demand to be between the Glass and Sebesta estimates.

OTA selected the ICF low projection of 138 million tons per year for its low demand scenario for 1985. This figure is lower than presently contracted Powder River basin production for 1985 (about 160 million tons per year) and allows analysis of the implications of a "worst case" scenario on development and diligence.

## Demand Projections for 1990

For 1990, the projections shown in figure 34 vary widely, and the clustering of projections, although marked, offers less reliable guidance than for 1985. Projections range from 163 million tons per year (the ICF low) to 438 million tons per year (the DOE preliminary high), but the range of 163 million tons per year to 275 million tons per year includes

all but the DOE preliminary and ICF high projections and the DOE mid and high final production goals.

For 1990, the projections of Sebesta and Silverman in figure 34 include only demand for steam coal. However, the ICF, DOE, and Wyoming task force projections include demand for coal for synfuel, for export to foreign countries, and for industrial use. The ICF midlevel projection includes an estimate of about 10 million tons for synfuels from Montana and Wyoming and a total demand of 8 million tons of subbituminous low sulfur coal for foreign export; it is unclear from the ICF report, however, how much of this 8 million tons is projected to come from the Powder River basin. The DOE midlevel preliminary forecast assumes about 30 million tons of coal from Montana and Wyoming for synfuels in 1990, and the DOE final production goals assume about 45 million tons of coal from these two States for synfuels. For comparison, the ICF base (midlevel) projection estimates a total demand throughout the country of less than 50 million tons of coal for synfuels in 1990; the NCA "most likely" projection is 38 million tons. The DOE midlevel preliminary forecast estimates that about 100 million tons of coal will be used for synfuels production in the United States in 1990; the DOE final production goals assume about 200 million tons.

The Wyoming task force rated one synfuels property in the Powder River basin as having favorable production prospects for 1991—the Rochelle leaseblock with production projected at 6 million tons per year for 1991. \* Other synfuels properties in the Powder River basin were judged by the task force as unlikely to be producing by 1991. This projection is in agreement with the ICF projection of 10 million tons per year from all of Wyoming and Montana, as another property, Cherokee, may come into production for synfuels in southern Wyoming.

\*The 1991 production prospects of the Rochelle lease block have become less favorable since the Wyoming task force meeting in October 1980, because of the withdrawal of two of the partners in the Panhandle Eastern Wycoal Gas Project, to which Rochelle's coal is contracted.

NERC projections, which include only estimates of electric utility demand for coal, are not shown in figure 34 for reasons explained in footnote 2 on p. 171. The NERC figure of 881 million tons for total U.S. utility coal demand in 1990 is comparable to the ICF midlevel number of 862 million tons, but is lower than the DOE preliminary midlevel number of 906 million tons, NCA's most likely projection of 935 million tons, and the DOE final midlevel production goal of 994 million tons. If the Powder River basin captures the same share of the market for Western steam coal in 1990 as in 1979, (i. e., 65 percent, ) NERC figures translate to a demand of approximately 180 million tons for steam coal. Using the NERC estimated demand for all coal in the Powder River basin market area as the base, not just demand for Western coal, demand for Powder River basin steam coal in 1990 (assuming a 37 percent market share) would be about 170 million tons. Adding demand for industrial coal, synfuels, and foreign export, NERC projections translate to demand for Powder River basin coal in 1990 of about 200 million tons, assuming the Powder River basin market share of Western coal and of all coal remains the same in 1990 as in 1979.

The Powder River basin share of the steam coal market may expand over the next decade. Assuming all new Western steam coal demand is for Powder River basin coal in the Powder River basin market area, but that the old demand for Western steam coal retains its 1979 split between Powder River basin and non-Powder River basin coal, NERC projections translate to a demand estimate for Powder River basin coal in 1990 of approximately 255 million tons for all uses. \* \* NERC projections, interpreted as described above, give a range of demand for Powder River basin coal in 1990 of about 200 million to about 255 million tons; these calculations suggest that the DOE preliminary midlevel goals are high. \* \* \*

\* \* \*Including demand for industrial uses (5 percent addition to utility demand), synfuels and foreign export (about 10 million tons per year).

\* \* \*The same calculations using NERC's projections for utility Western coal demand published 1 year earlier, in July 1980, lead to a demand range of 235 million to 305 million tons for

## OTA High and Low Demand Scenarios: 1990

For 1990, OTA selected the DOE preliminary midlevel forecast of 275 million tons per year for its high demand scenario, and the ICF projection of 163 million tons per year for its low demand scenario. The Wyoming task force projection of 206 million tons per year, representing the estimate of informed regional opinion, falls slightly below the average of these two demand levels. The high scenario level of 275 million tons per year is 33 percent above the Wyoming task force estimate, and the low scenario level of 163 million tons per year is 79 percent of the Wyoming task force estimate. OTA's selected low projection is lower than present contracts for 1990 delivery of Powder River basin coal (186 million tons per year) and thus allows analysis of a "worst case" for development and diligence,

### Production Under OTA's Two Demand Scenarios

The next two sections examine the production prospects of all Federal coal leases in the Powder River basin for 1986 and 1991. The first of these sections focuses on the leases included in producing mines or approved mine plans; the second on undeveloped leases. This section describes the approach used by OTA to allocate production under the high and low demand scenarios.

In its two demand scenarios, OTA allocated potential production among:

1. operating and permitted Federal mines;
2. leases with no mine plans\* (undeveloped leases) but with favorable development potential; and
3. non-Federal mines.

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Powder River basin coal in 1990. The difference between the demands derived from NERC 1980 and 1981 projections is caused by the fact that in 1981 NERC projected 50 million tons less 1990 demand for Western coal than it did in 1980.

\*There are two mines in preliminary permit review in the Powder River basin (South Rawhide and Antelope). Because of the early stages of development of these mine plans, these leases were analyzed with the undeveloped leases.

Under the high demand scenario, demand for Powder River basin coal in 1985 and 1990 is above present contracts for those years. Thus, for all three categories of coal production, present contracts for 1985 and 1990 are assumed to be met in full under the high demand scenario. Under the low demand scenario, demand for Powder River basin coal in 1985 is about 85 percent of present contracts for 1985, and about 90 percent of present contracts for 1990. Thus, under the high demand scenario, all Federal and non-Federal mines and all undeveloped leases with contracts are assumed to be producing at or above the current contract level for those years; under the low demand scenario, they are assumed to be producing at about 85 to 90 percent of the current contract level for those years.

For both 1985 and 1990, OTA selected the ICF low demand projections for its low demand scenarios. For each of these years, under the low demand scenario, no undeveloped leases without current contracts go into production. With the exception of three lease blocks (Antelope, North Antelope, and Rochelle), the undeveloped leases in the Powder River basin do not yet have contracts. Under the high demand scenario, many undeveloped leases would likely go into production by 1990 because demand under this scenario requires considerably more production than the sum of current contracts for future delivery of coal. The difference between demand and contracts is allocated among currently operating and permitted Federal mines, non-Federal mines, and undeveloped leases with favorable production prospects. No production is allocated to leases that, for technical or economic reasons, are unlikely to be brought into production by 1990.

A share of the demand increase is assigned by formula to each Federal mine or undeveloped lease block likely to be producing in 1985 or 1990, with only its projected capacity and its contracts (if any) entering the calculation. Allocation by formula is arbitrary. Some lessees will be more successful than others in competing for new coal contracts. Production will be higher from some mines than OTA es-

imates indicate, and lower from others. In the following section, OTA's estimates of production from operating and permitted Feder-

al mines plans under the high and low demand scenarios are compared with the lessees' own estimates.

## Federal Leases in Approved Mine Plans and Operating Mines in the Powder River Basin

This section assesses the production prospects for Federal coal leases in approved mine plans and operating mines in the Powder River basin. Tables 57 and 58 summarize technical and production data for each operating or permitted mine with Federal coal reserves in the Powder River basin. Together, these tables provide an overview of recent Federal mine capacity and production in the basin and expected developments in the coming decade.

Table 57 presents the following information for each mine in the Powder River basin with Federal reserves:

- lessee;
- number of Federal leases in the mine plan;
- range of recoverable reserves;
- permitted mine plan and Federal lease acreage;
- date of first coal shipments;

**Table 57.—Powder River Basin Federal Mine Statistics**

Mine name	Lessee <sup>c</sup>	Number of Federal leases	Federal <sup>a</sup> lease reserves	Acreage		First coal shipped	Cumulative production 1976-1979	Production 1979	Remaining mine life
				Total permitted mine plan acreage	Federal lease acreage				
		(billion tons)					(million tons)		
<b>(Montana)</b>									
Rosebud	Western Energy Co.	5	HM	6,198	8,227	1920's	41.3	11.7	40 years
Big Sky	Peabody Coal Co.	1	LM	2,351	4,307	1969	9.3	2.5	38 years
Spring Creek	Spring Creek Coal Co.	1	L	3,016	2,347	1980	0.0	0.0	25 years
West Decker	Decker Coal Co.	4	HM	3,137	4,961	1972	55.7	7.1	21 years
East Decker	Decker Coal Co.	1	L	4,378	9,410	1978	5.9	5.9	27 plus years
Montana totals		12	0.8	19,080	29,252		112	27.2	
<b>(Wyoming)</b>									
Buckskin	Shell Oil Co.	1	LM	1,467	600	1981	0.0	0.0	16 years
Rawhide	Carter Mining Co.	1	L	7,393	5,697	1977	7.2	3.6	26 years
Eagle Butte	AMAX Coal Co.	1	L	4,304	3,520	1978	4.0	3.7	37 years
Wyodak	Wyodak Resources	3	HM	3,240	1,880	1922	6.3	2.4	43 years
Caballo	Carter Mining Co.	2	L	10,040	5,360	1979	1.4	1.3	44 years
Belle Ayr	AMAX Coal Co.	2	L	6,280	2,401	1973	53.8	15.0	19 years
Rojo Caballos	Mobil Oil Corp.	2	L	5,815	3,959	1983	0.0	0.0	27 years
Cordero	Sunoco Energy Dev. Co.	1	L	8,232	6,560	1976	9.8	3.8	26 years
Coal Creek	Atlantic Richfield Co.	1	L	9,545	5,806	1981	0.0	0.0	35 years
Jacobs Ranch	Kerr-McGee Coal Co.	2	L	4,959	4,352	1978	6.5	4.7	22 years
Black Thunder	Thunder Basin Coal Co.	2	L	7,560	5,864	1977	10.3	6.2	38 years
Dave Johnston	Pacific Power & Light Co.	6	LM	14,305	9,662	1958	13.1	3.8	16 years
Wyoming totals		24	4.4	83,140	55,680		112	44.5	
Powder River basin totals:		36	5.3	102,220	84,932		225	71.7	

<sup>a</sup>Non-Federal reserves in logical mining units with these Federal lease reserves will add approximately 0.3 billion tons of recoverable reserves in both Montana and in

Wyoming to the above totals (approximately 0.6 billion tons in all would be added to the above Powder River basin lease total).

<sup>b</sup>As reported by the lessees in their mine plans.

<sup>c</sup>See the OTA Working Lease List, app. B, for a listing of both parent Companies and subsidiaries.

Key to reserve ratings:

S = small reserves (zero to 30 million tons)

LM = low to medium reserves (30 million to 100 million tons)

HM = high to medium reserves (100 million to 180 million tons)

H = high reserves (over 180 million tons)

SOURCE: Office of Technology Assessment,

**Table 58.—Powder River Basin Federal Mine Production, Capacity, and Contracts**  
(millions of tons per year)

Mine name	1980 mine design capacity	Production 1980	1986 mine design capacity	OTA estimated production-1986 demand scenario		Contracts for 1986	Lessees' estimates of production-1986	1991 mine design capacity	OTA estimated production-1991 demand scenario		Contracts for 1991	Lessees' estimates of production-1991
				H	L				H	L		
<b>Montana</b>												
Rosebud	14.2	10.4	19.6	19.5	16.3	19.4	19.4	19.8	19.8	17.5	19.8	19.8
Big Sky	4.6	3.0	4.6	4.6	3.9	4.6	4.6	4.6	4.6	4.1	4.6	4.6
Spring Creek	0.2	0.1	10.0	7.6	5.9	7.0	7.6	10	9.2	6.2	7.0	10.1
West Decker	10.4	5.6	10.4	7.5	5.6	6.7	8.0	10.4	9.4	5.9	6.7	8.0
East Decker	6.7	5.6	6.7	6.8	5.6	6.7	6.6	6.7	6.9	5.9	6.7	6.6
Montana totals	36	24.7	52	46	37	44	46	52	50	40	45	49
<b>Wyoming</b>												
Buckskin	0	0	6.2	6.2	5.2	6.2	6.2	6.2	6.2	5.5	6.2	6.2
Rawhide and Caballo	12+4	6.4	24+ 12	20.4	13.5	16.0	31.0	24+ 12	30.7	14.2	16.0	360
Eagle Butte and Belle Ayr	14+21	24.5	25+ 11	33.7	27.8	33.0	33.0	25+ 11*	35.2	29.2	33.0	320
Wyodak	3	2.6	5	3.4	2.5	3.0	3.0	5	4.9	4.0	4.5	4.5
R o j o Caballos	0	0	9	4.5	2.7	2.6	9.0	15	12.5	5.0	5.6	15.0
Cordero	24	6.5	24	13.9	9.3	11.0	16.0	24	20.5	9.7	11.0	24.0
Coal Creek	0	0	12	6.4	4.0	4.8	9.8	12	10.1	4.2	4.8	12
Jacobs Ranch	16	8.2	16	13.6	11.1	13.2	15.6	16	15.3	11.7	13.2	15.6
Black Thunder	14	10.5	20.5	17.4	13.9	16.5	17.0	20.5	19.4	14.6	16.5	20.5
Dave Johnston	3.8	3.8	3.8	3.7	3.1	3.7	3.7	3.6	3.6	3.3	3.7	3.7
Wyoming totals	112	62.5	169	123	93	110	144	175	159	101	115	170
Powder River basin totals	148	87.2	220	169	130	154	191	226	209	141	159	219

\*This capacity estimate based on remaining reserves.

SOURCE: Office of Technology Assessment

- recent production levels; and
- remaining mine life.

Table 58 summarizes information on capacity, production, and contracts for this decade. Mine design capacity and production are presented for 1980. Capacity figures for 1986 and 1991 are then followed by estimated production for each of these years under the high and low demand scenarios discussed in the preceding section. The amount of coal already contracted for 1986 and 1991 is listed next, along with the production estimated by each lessee. Contract information and company estimates of production are taken from lessee mine plans submitted to the Office of Surface Mining (OSM) or from communications with the lessees.

### Size of Federal Mines in the Powder River Basin

**Acreage:** There are over 100,000 permitted mine plan acres for mines with Federal leases in the Powder River basin; 85,000 of these acres contain Federal reserves. Eighty percent of the permitted acreage is lo-

cated in the Wyoming section of the basin. Not all of the Federal lease acreage associated with Federal mines is necessarily included in the permitted mine plan. In the Montana portion of the Powder River basin, for example, the five Federal leases associated with the Rosebud Mine cover 8,227 acres but only 75 percent of this acreage is permitted in the mine plan; the total acreage permitted in the mine plan at the East Decker Mine is less than 4,400 acres although the four Federal leases associated with this mine cover approximately 9,400 acres,

Lease acreage is important for gaging potential environmental impacts, but it is not always a good indicator of mine capacity or production potential. The Dave Johnston Mine, for example, has a small capacity (3.8 million tons per year) compared to other mines in the basin even though it includes the largest total Federal lease acres (9,662) and the greatest number of mine plan acres (14,305) in the basin. This mine has been in production since 1958. At present, mining is limited to two seams, which average about 45 ft in thickness and are captive to a power-

plant that can use only 3.8 million tons per year.

**Reserves:** About 90 percent of the nearly 6 billion tons of recoverable reserves associated with approved mine plans or operating mines with Federal leases in the Powder River basin are Federal reserves. As table 57 shows, the Federal lease reserves associated with these approved mine plans and mining operations are generally large (over 180 million tons). Only three of these mines have Federal lease reserves of less than 100 million tons.

**Mine Life:** Mines with Federal leases in the Powder River basin have substantial production potential manifested by the mine life remaining for these properties. Estimates for remaining mine life in table 57 are taken from the lessees' mine plans. Mine life estimations are calculated by dividing the remaining recoverable reserves by the lessees' long term annual production plans. Should production fall below the lessees' estimates, then mine life would be extended. This could happen in a number of cases if demand for Powder River basin coal in 1990 turns out to be close to the estimates made by the Wyoming task force (see fig. 34) and does not subsequently increase rapidly in the 1990's. Mine life could also be extended if a lessee obtains additional reserves.

Most of the mines with Federal leases in the Powder River basin that opened in the late 1970's, or are still under construction, are expected to remain in production for at least 25 years. Only two mines (East Decker in Montana and Buckskin in Wyoming) will have a capacity of less than 10 million tons per year by 1991. The two mines that opened in the 1920's, Rosebud in Montana and Wyo-dal in Wyoming, are scheduled to remain in production for another 40 years. The Dave Johnston Mine, which opened in the late 1950's, has 16 years expected mine life (3.8 million tons per year capacity); the Big Sky Mine, which opened in 1969, has 38 years of mine life remaining (4.6 million tons per year capacity).

## Trends in Mine Capacity and Production

Most of the 17 mines with Federal leases in the Powder River basin are currently operating below capacity. These mines produced 87 million tons in 1980, 61 million tons less than their combined design capacity of 148 million tons. The design capacity of these mines is expected to increase by 50 percent in this decade from 148 million tons per year in 1980 to 226 million tons per year in 1991. The magnitude of this increase in capacity is illustrated by a comparison of the Belle Ayr Mine in Wyoming with several of the newer mines in the basin. Belle Ayr has achieved the highest annual production of coal in the United States since 1977. However, Belle Ayr's current capacity (21 million tons per year) is scheduled to be surpassed by three new mines in the basin by 1986: Eagle Butte (25 million tons per year), Rawhide (24 million tons per year), and Cordero (24 million tons per year). Production at Belle Ayr is expected to decrease from its present high level.

Demand will dictate whether or not the design capacity of mines with Federal leases in the Powder River basin will be fully used over the next 10 years. Under OTA's low demand scenario, substantial overcapacity of these mines will continue and capacity utilization will not move much beyond 60 percent in either 1986 or 1991. \* Under OTA's high demand scenario, production at these mines would reach 77 percent of capacity in 1986 and 92 percent of capacity in 1991. According to the lessees' estimates of production, capacity utilization will be 87 percent in 1986 and 97 percent in 1991. Contracts have been secured for 70 percent of capacity for both 1986 and 1991.

\*It is possible that not all of this capacity would be developed if markets for Powder River basin coal were weak. The potential for continued overcapacity in the Powder River basin is increased when the undeveloped lease blocks are considered in the next section,

## Expansion of New Federal Mines in the Powder River Basin

Of the 17 mines with Federal leases in the Powder River basin, 11 are relatively new, i.e., have opened since 1976 or will open early in this decade. These new mines now account for over 90 million tons of capacity and are scheduled to reach a total capacity of over 165 million tons per year by 1986, and over 170 million tons per year by 1991.

New mines with Federal leases in the Powder River basin have generally followed the same development pattern, reaching a large capacity and high levels of production within a decade after they open. By 1986, according to the lessees' production plans, most of the 11 new Federal mines in the Powder River basin will be producing at least 75 percent of capacity. By 1991, according to the lessees' production plans, nearly all of these new mines will be producing at, or nearly at, full capacity. Each of these new mines has a contractual commitment for production through 1991. In some cases these contracts represent a substantial amount of capacity.

Several of these new Federal mines illustrate the rapid expansion of Federal mine capacity and production in the Powder River basin. For example, the Eagle Butte Mine in Campbell County, produced 3.7 million tons in 1979 after opening in 1978. By 1986, Eagle Butte is likely to be the largest coal mine with Federal leases in the United States with a capacity of 25 million tons per year and production of 23.8 million tons per year needed to fill its contract obligations. Only Federal reserves will be mined at Eagle Butte after 1985. AMAX has contracts for 90 percent of the reserves planned for production at both its Eagle Butte and Belle Ayr mines. Coal from these mines is marketed jointly.

The Black Thunder Mine in Campbell County, Wyo., is another example of rapid expansion of Federal mine capacity and production in the Powder River basin. This mine, which opened in 1977, is scheduled to achieve a capacity of 20.5 million tons per year by late 1981. Production of Federal reserves

should begin at Black Thunder in 1981 and, by 1984, Federal reserves will account for all production. Black Thunder has approximately 80 percent of capacity contracted through 1991.

The Rawhide Mine in Campbell County, which also opened in 1977, showed low cumulative production (7.2 million tons per year) in the 1976-79 period. However, the lessee expects to be producing at full capacity at a rate of 24 million tons per year by 1986, although new contracts to achieve this level have yet to be signed. This capacity should be available in 1985, 8 years after the first coal was shipped from the mine. The lessee, Carter Mining Co., markets coal jointly from its Rawhide and Caballo mines and has contracts for 16 million tons per year beginning in 1984. Only Federal reserves will be produced at these mines.

### Importance of Federal Reserves

Over the next 10 years, the proportion of Federal reserves that will be recovered at these mines will increase substantially. Of the 11 new Federal mines in the Powder River basin, three (Rawhide, Eagle Butte, and Caballo) were producing no Federal reserves in 1979. However, by 1986, each of these three new mines will produce only from Federal reserves.

The growing importance of Federal reserves in the Powder River basin is illustrated in table 59. In 1979, Federal reserves accounted for 42 percent of the total production of coal from mines with Federal leases in the Powder River basin. By 1986, according to lessee mine plans, 90 percent of the coal produced from these mines will be from Federal reserves. This percentage is expected to hold for 1991.\*

\*Note that the estimated percentage of Federal production differs little between 1986 and 1991 and among the three production estimates. However, the production of non-Federal reserves will decrease substantially in the early 1980's, from 42 million tons per year in 1979 to 20 million tons per year in 1986 (according to lessee estimates) while, at the same time, the production of Federal reserves will be increasing substantially.

**Table 59.—Estimates of Federal Portion of Federal Mine Production in the Powder River Basin<sup>a</sup>**

1979 actual production (million tons per year)			1986 estimated production (million tons per year)		1991 estimated production (million tons per year)	
Total:	72	OTA high demand scenario <sup>c</sup>	Total:	169	Total:	209
			Federal:	150	Federal:	189
				% Federal: 89%		% Federal: 90%
Federal:	30	OTA low demand scenario <sup>c</sup>	Total:	130	Total:	141
			Federal:	116	Federal:	125
				% Federal: 89%		% Federal: 89 <sup>o</sup> /0
% Federal:	42 <sup>o</sup> /0	Lessee estimates <sup>b,c</sup>	Total:	191	Total:	219
			Federal:	171	Federal:	201
				% Federal: 90%		% Federal: 92 <sup>o</sup> /0

<sup>a</sup>Federal mines in currently approved mine plans only.

<sup>b</sup>Lessee estimates are taken from the mine plans.

<sup>c</sup>For 1986 and 1991, in the Montana portion of the powder River basin, the Federal portion of Federal mine production is estimated to be approximately 65 percent in all three estimates; in the Wyoming portion, the Federal portion is estimated to be over 97 percent.

SOURCE: Office of Technology Assessment

### Nonfederal Mines in the Powder River Basin

Five mines with no Federal reserves in the Powder River basin (two in Montana and three in Wyoming) were responsible for 11.7 million tons of coal production in 1980. These five mines had a combined capacity of nearly 20 million tons per year compared to 148 million tons per year of total Federal mine capacity in the basin. Table 60 compares the capacity of currently operating and permitted Federal mines with non-Federal mines that have favorable production prospects. Scheduled capacity for these mines is presented for 1986 and 1991. The total non-Fed-

eral share of capacity in the basin is unlikely to go beyond 12 percent in 1986 and 16 percent in 1991.

Table 61 presents information on the capacity and contracts for non-Federal mines in the Powder River basin that are likely to be in production by either 1986 or 1991. While the combined capacity of 12 non-Federal mines in the Powder River basin could increase substantially during this decade—to 29 million tons per year in 1986 and 44 million tons per year in 1991—only three of these mines

**Table 60.—Capacity in the Powder River Basin: Federal and Non-Federal Mines**

	1980 (million tons per year)	1986 <sup>a</sup> (million tons per year)	1991 <sup>a</sup> (million tons per year)
Montana			
Federal mines . . . . .	36	52	52
Non-Federal mines . . . . .	11	13	30
Total . . . . .	47	65	81
Wyoming			
Federal mines . . . . .	112	169	175
Non-Federal mines . . . . .	9	16	14
Total . . . . .	121	184	189
Powder River basin totals			
Federal mines . . . . .	148	220	226
Non-Federal mines . . . . .	20	29	44
Total . . . . .	168	249	270

<sup>a</sup>Does not include potential capacity from undeveloped Federal leases. See table 63

SOURCE: Office of Technology Assessment.

**Table 61.—Non-Federal Mine Development in the Powder River Basin, 1986-91**

Likely by 1991	1986		1991	
	Capacity	Contracts	Capacity	Contracts
Montana:				
Absaloka <sup>a</sup> . . . . .	10.5	5.1	10.5 (15) <sup>c</sup>	5.1
Brophy No. 2 . . . . .	0.2	0	0.2	0
Montco . . . . .	2.0	0	9.0 (12) <sup>c</sup>	0
Young's Creek . . . . .	—	—	8.0	0
Coal Creek <sup>a</sup> . . . . .	0.2	0	0.2	0
Bull Mountain . . . . .	0.5	0	2.0	0
Totals . . . . .	13.4	5.1	29.9	5.1
Wyoming:				
Bighorn <sup>a</sup> . . . . .	3.0	3.0	3.0	3.0
Dutchman . . . . .	1.0	0	1.0	0
Welch No. 1 . . . . .	1.0	0	1.0	0
Wymo <sup>b</sup> . . . . .	4.0	2.0	4	2.0
Fort Union <sup>a</sup> . . . . .	1.5	0	0	0
Clovio Point <sup>a</sup> . . . . .	5.0	0	5.0	0
Totals . . . . .	15.5	5.0	14.0	5.0
Grand totals . . . . .	28.9	10.1	43.9	10.1

<sup>a</sup>Producing in 1980. Total capacity of mines producing in 1980 is 20 million tons per year.

<sup>b</sup>Contracts for captive production for utilities. The capacity shown here could probably not be sustained much beyond 1991 without new leasing of Federal coal.

<sup>c</sup>Potential capacity in the 1990's.

SOURCE: Office of Technology Assessment.

now have contracts for a total of 10.1 million tons per year for 1991.

### Estimated Cumulative Production Under OTA's High and Low Demand Scenarios for the Powder River Basin 1976=91

Table 62 presents information on the cumulative production of mines with Federal leases under OTA's high and low demand scenarios. Cumulative production from these mines in the basin from 1980-91 under the high demand scenario (1,916 million tons) is 30 percent more than that projected under the low demand scenario (1,480 million tons).

In the 1976-79 period, the cumulative production of mines with Federal leases in the Wyoming and Montana sections of the Powder River basin were almost identical. However, mines with Federal leases in the Wyoming section of the basin, with their larger reserves, will dominate coal production in this decade. Most of this new production will come from the nine new mines discussed above. The Eagle Butte Mine, for example, shipped its first coal in 1978 and produced only 4 million tons between 1976-79; however, under OTA's high demand scenario, this mine would produce 95 million tons between 1980-86, and 110 million tons between 1987-91. The Cordero Mine, which opened in

1976, also has the potential for high cumulative growth from 1980 to 1991; from 9.8 million tons in the 1976-79 period to 61.4 million tons in 1980-86 and 72.4 million tons in 1987-91. Similar increases could occur at the other new mines in the basin. Some increased production will also come from the expansion of older mines.

### Lessee Production Plans and OTA High= Low Demand Scenario Projections: A Summary Comparison

Figures 35 and 36 present a graphic comparison of the production estimates of the lessees with those under OTA's high and low demand scenarios presented in table 58. The lessees' estimated production for 1986 is 23 percent (36 million tons) more than production currently under contract for that year;

**Table 62.—OTA Estimated Cumulative Production<sup>a</sup> Under High and Low Demand Scenarios for the Powder River Basin: 1976-91 (millions of tons)**

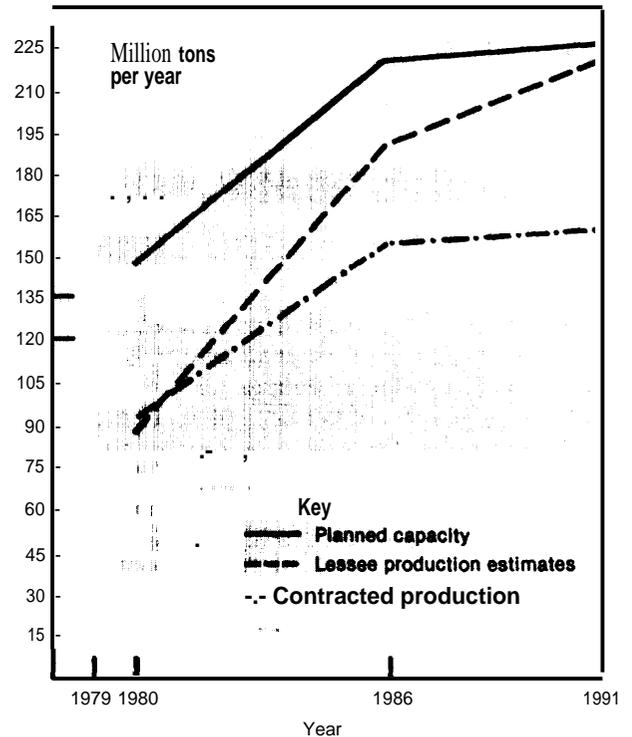
	Cumulative production 1976-79	Estimated cumulative production 1980-86	Estimated cumulative production 1987-91	Estimated cumulative production 1980-91
Montana portion of the Powder River basin . . . . .	112	H -272 L -232	H -243 L -194	H - 514 L - 425
Wyoming portion of the Powder River basin . . . . .	112	H -677 L -561	H -726 L -493	H -1402 L -1054
Total Powder River basin . . . . .	225	H -948 L -793	H -968 L -687	H -1916 L -1480

<sup>a</sup>For operating and permitted mines with Federal leases. See table 57, powder River Basin Federal Mine Statistics. Potential production from undeveloped leases is not included in these tables

SOURCE: Office of Technology Assessment

**Figure 35.— Lessee Production Estimates**

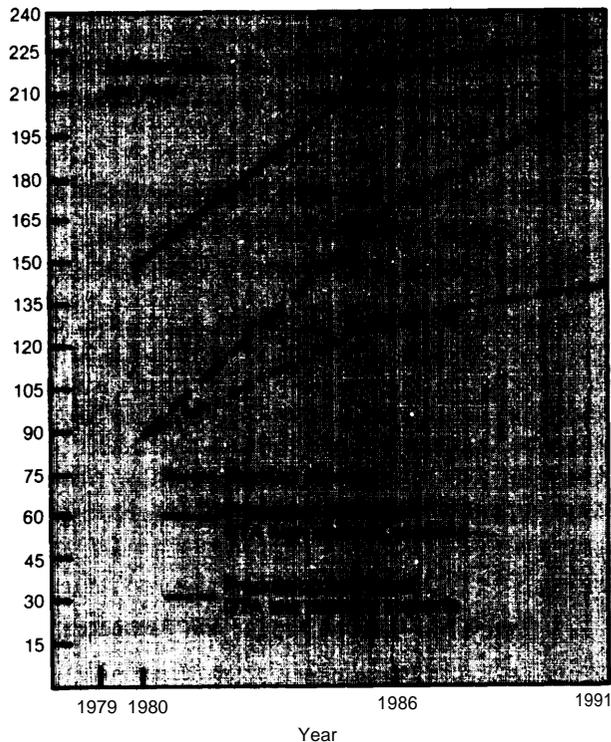
For operating and permitted mines with Federal leases (see table 58)



SOURCE: Office of Technology Assessment.

**Figure 36.—Production Estimates:  
OTA High and Low Demand Scenarios**

For operating and permitted mines with Federal leases (see table 58)



SOURCE: Office of Technology Assessment.

for 1991 their estimated production is 38 percent (60 million tons) more than coal currently under contract for 1991.

OTA's estimates of production under the high demand scenario in 1991 are only 10 million tons less than the production estimates of the lessees, however, OTA's production estimates under the low demand scenario are substantially lower than those of the lessees. For 1991, the difference between the two projections is 78 million tons. OTA's estimates under the low demand scenario closely parallel production already under contract.

## Development Potential and Production Prospects of Undeveloped Leases in the Powder River Basin

The preceding section examined the production prospects of operating and permitted mines with Federal leases in the Powder River basin for 1986 and 1991. The discussion focused on the design capacity, total production, and production of Federal reserves from these mines over the next 10 years. This section examines the production prospects of the 21 undeveloped lease blocks (37 leases) in the Powder River basin under OTA's high and low demand scenarios. The production estimates for each of these leases are based on OTA's review of their development potential, the plans of the lessees, and other considerations likely to affect production,

The potential capacity that these leases could add to the Powder River basin is significant, totaling 81 million tons per year by the end of this decade. Under OTA's high demand scenario these leases could produce 11 million tons in 1986; under the low demand scenario, 5.6 million tons. In 1991, under the high demand scenario, these leases could produce 65 million tons per year; their production would only be 17 million tons in 1991 under the low demand scenario. However, as table 63 shows, 11 undeveloped lease blocks (20 leases) of the 21 undeveloped lease blocks (36 leases) in the Powder River basin have unfavorable production prospects over the next

Table 63.—Production Prospects for Undeveloped Leases: Powder River Coal Basin

Development potential	Lessee <sup>1</sup>	Number of Leases	Location by county <sup>2</sup>	Acres	Capacity <sup>3</sup> Reserves		Production prospects <sup>4</sup>	
					(million tons)	(billion tons)	1986	1991
<b>Leases with favorable development potential</b>								
Antelope	Resource Development Co.	3	Converse	4,817	8.0 (12.0)	L	Favorable(a)	Favorable
N. Antelope	N. Antelope Coal	1	Campbell	320	5.0	S	Favorable(a)	Favorable
South Rawhide	Carter Mining	1	Campbell	4,782	12.0	L	Favorable(b)	Favorable
Rochelle	Peabody Coal	2	Campbell	8,821	6.0 (11.0)	L	Unfavorable	Favorable(e)
Dry Fork	Cities Service	3	Campbell	3,580	8.0 (15.0)	L	Uncertain	Uncertain
E. Gillette Fed.(h)	Kerr-McGee Co.	3	Campbell	4,343	15.0	L	Uncertain	Uncertain
N. Rochelle	Shell Oil Co.	1	Campbell	2,000	8.0	L	Uncertain	Uncertain
CX Ranch	Consolidation Coal	1	Big Horn, Mt	674	8.0	S	Uncertain	Uncertain
CX Ranch	Peter Kiewit Sons, Inc.	1	Big Horn, Mt	524	4.0	S	Unfavorable	Uncertain
Wildcat	Gulf Oil Co.	1	Campbell	1,571	7.0 (10.0)	L	Unfavorable	Uncertain(e,g)
Lake DeSmet(e)	Texaco	5	Johnson	9,417	— (20.0)	L	Unfavorable	Unfavorable(e,g)
Phillips Creek (l)(c)	PPL	4	Converse	4,039	—	S	Unfavorable	Unfavorable
<b>Totals</b>		<b>26</b>		<b>44,888</b>	<b>81 (120)</b>	<b>3.3</b>		
<b>Leases with uncertain development potential</b>								
Bass Trust(f)	R.D. Bass Trust Estate	1	Sheridan	20,701	—	L	Unfavorable	Unfavorable
Belco(f,h)	Belco Petroleum	1	Johnson	4,551	—	L	Unfavorable	Unfavorable
Gulf (1) & (2)(f)	Gulf Oil Corp.	3	Sheridan	4,366	—	HM	Unfavorable	Unfavorable
East Wyodak(d)	Peabody Coal	1	Campbell	2,560	— (7.0)	LM	Unfavorable	Unfavorable(e,g)
Pearl	Shell Oil Corp.	1	Big Horn, Mt	541	— (2.0)	LM	Unfavorable	Unfavorable
<b>Totals</b>		<b>7</b>		<b>32,719</b>	<b>— (9.0)</b>	<b>0.7</b>		
<b>Leases with unfavorable development potential</b>								
Armstrong(h)	Big Horn Coal	1	Sheridan	80	—	S	Unfavorable	Unfavorable
Blue Diamond	Wyodak Resources	1	Campbell	40	—	s	Unfavorable	Unfavorable
Gulf (3)(h)	Gulf Oil Corp.	1	Campbell	756	—	S	Unfavorable	Unfavorable
Phillips Creek (2)	PPL	1	Converse	40	—	s	Unfavorable	Unfavorable
<b>Totals</b>		<b>4</b>		<b>916</b>	<b>—</b>	<b>&lt;0.01</b>		

<sup>1</sup>Counties are in Wyoming unless otherwise noted

<sup>2</sup>Numbers without parentheses show capacities for 1991, numbers in parentheses indicate capacities after 1991

<sup>3</sup>Where footnote appears under "development potential" it is relevant to the development of the lease. Footnotes under "production prospects" are relevant to production prospects only.

<sup>4</sup>See the Working Lease List, app. B, for a listing of both parent companies and subsidiaries

**Key to production prospects**

- (a) coal already under contract  
 (b) coal may be combined with contracted production of another mine owned by the same company  
 (c) plans to incorporate into existing mine plan  
 (d) may be incorporated with PRLA to form LMU  
 (e) production contingent on synfuel development  
 (f) production dependent on in situ gasification  
 (g) production contingent on onsite steam electric plant  
 (h) may be traded under provisions of Public Law 95-554

**Key to reserve ranking**

- S = small reserves (zero to 30 million tons)  
 LM = low to medium reserves (30 million to 100 million tons)  
 HM = high to medium reserves (100 million to 180 million tons)  
 L = large reserves (over 180 million tons)

SOURCE Off Ice of Technology Assessment

10 years even under favorable market conditions.

### Undeveloped Leases With Favorable Development Potential

Four undeveloped lease blocks (7 leases)—Antelope, North Antelope, South Rawhide and Rochelle—in the Powder River basin with favorable development potential have favorable production prospects for 1991. These lease blocks cover 18,740 acres; three contain relatively large reserves.

Only one of these lease blocks, Rochelle, is not likely to be producing under OTA's low demand scenario in 1986. Production at the Rochelle lease is contingent on the pace of development at the Panhandle Eastern Gasification plant in Douglas, to which 500 million tons of Rochelle's reserves have been committed. Panhandle's plans called for production in 1986, using coal at a rate of about 6 million tons per year with an additional 1 million to 2 million tons per year possibly going to an associated steam/electric plant. DOE has funded a feasibility study on the Panhandle

Eastern project but production prospects for the Rochelle lease are unfavorable for 1986 because of the time required for the development of a synthetic fuels project. However, by 1991 the Rochelle lease is assumed to produce 6 million tons of coal under both the high and low demand scenarios. \*

The South Rawhide lease, although without contracts, would begin production in 1985 and expand to 9 million tons per year by 1991 under the high demand scenario. If no contracts are obtained for this property, the lessee (Carter Mining Co.) may mine coal at South Rawhide to blend with the coal produced at the company's Rawhide and Caballo mines for which contracts have already been secured. If this occurs, production at the Rawhide and Caballo mines would be reduced proportionately.

Coal from the North Antelope lease will be shipped to Middle South Utilities in Arkansas, a group of several utilities scheduled to begin operation in 1984. Using company projections for this lease, OTA has estimated that approximately 4.5 million tons per year will be produced under the low demand scenario and 5 million tons per year under the high demand scenario in 1991 unless construction of the plants is delayed. Mining operations at North Antelope will include reserves from the Rochelle lease.

All planned production from the Antelope lease is also contracted through 1991; thus, production prospects for both 1986 and 1991 for this lease are favorable. The lessee plans to produce 5.6 million tons per year by 1990 and increase production to 12 million tons per year by 1993.

Four lease blocks (eight leases) with favorable development potential, covering 10,696 acres, have uncertain production prospects for both 1986 and 1991. Thus, under OTA's high demand scenario these lease blocks could be producing by 1991; however, their

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\*The 1991 production prospects of the Rochelle lease block have become less favorable recently because of the withdrawal of two of the partners in the Panhandle Eastern WyCoal Gas Project.

prospects for production are unfavorable through 1991 under the low demand scenario. Three of these lease blocks—Dry Fork, East Gillette Federal, and North Rochelle—have substantial reserves and favorable property characteristics. The CX Ranch lease, held by Consolidation Coal Co., has small Federal reserves with otherwise favorable property characteristics and is associated with significant amounts of non-Federal coal.

The Dry Fork lease block, held by Cities Service Co., could produce 0.4 million tons per year by 1986 and 5.9 million tons per year by 1991 under the high demand scenario. Six hundred forty acres of State coal could possibly be included in mining operations. There are no contracts for coal from the lease at this time.

According to the Western Coal Planning Assistance Project, coal produced on the East Gillette Federal lease block (which could produce 11 million tons in 1991 under the OTA high demand scenario) will be delivered to four utilities in Arkansas, Louisiana, and Oklahoma. Parts of two of the three leases at East Gillette Federal are included in exchange negotiations authorized under Public Law 95-554, but the exchanges would not affect the viability of the mining operation. (See ch. 9 for a discussion of exchanges. )

North Rochelle's production could reach 5.9 million tons per year by 1991 under the high demand scenario. The lessee, Shell Oil Co., plans to apply for a mining permit by 1984 and is currently conducting mine feasibility and environmental studies. It appears likely that sales of the coal on the lease will be directed to steam/electric use, at least in the near term, though none of the coal has yet been sold. Another option for Shell is to use the coal to meet contract obligations at Shell's Buckskin Mine, where the status of some recoverable reserves is uncertain because of alluvial valley floor considerations. Development for synfuels is also a possibility for the 1990's.

Consolidation Coal's CX Ranch could begin production before 1986; capacity could be 8

million tons per year by 1991. Federal coal has been integrated with State and fee coal already held by the lessee. Although markets for the coal have yet to be identified, the lessee is exploring both steam/electric and synthetic fuels markets. Environmental studies are underway and the lessee plans to submit a mine permit application in 1981. Under the high demand scenario, in 1991 Consolidation's CX Ranch lease could produce close to 6 million tons per year. \*

Both the CX Ranch lease, held by Peter Kiewit Sons, Inc., and Gulf Oil's Wildcat lease have unfavorable production prospects for 1986. Either lease could be producing by 1991 under the high demand scenario but neither is likely to be producing by 1986 even under the high demand scenario.

Production from Gulf Oil's Wildcat lease could reach 5 million tons per year by 1991 with much of this tonnage expected to be used for onsite power generation. The lessee has developed a preliminary mine plan that may be submitted within the next few years. However, development of this lease block may be more difficult and costly than the development of most other leases in Campbell County because the geology of the coal seams is very complex. The CX Ranch lease could have a capacity of 4 million tons per year and produce close to 3 million tons per year by 1991; however, none of the coal on the lease has yet been sold.

Two lease blocks (9 leases) with favorable development potential—one contingent on synfuels, (Lake DeSmet) the other contingent on integration into an existing mine (Phillips Creek (1))—have unfavorable production prospects for both 1986 and 1991. Thus, these leases are not likely to go into production by 1991 even under the high demand scenario. Lake DeSmet has large reserves, Phillips Creek small reserves. The Phillips Creek block, recently acquired by the Pacific Power & Light Co. is expected to be incorporated into the Dave Johnston Mine. Even if this oc-

curs, mining of the lease would probably not take place until after 1991,

Although four of the five Lake DeSmet leases are not contiguous, the lessee owns all of the intervening non-Federal coal. Production from this lease depends on the development of synfuels. The lessee submitted a joint application to DOE for a feasibility study with Transwestern Coal Gasification Co. However, this study was not funded. No commitments or contracts for development of the coal have yet been obtained.

### Undeveloped Leases With Uncertain Development Potential

Five lease blocks (7 leases) in the Powder River basin—Bass Trust, Belco, Gulf (1&2), East Wyodak, and Pearl—have uncertain development potential. These leases contain **32,719** acres and have sizable reserves. Each lease has unfavorable production prospects for both 1986 and 1991. It is unlikely, therefore, that these leases would go into production by 1991 even under OTA's high demand scenario.

The production prospects of the Bass Trust, Belco, and Gulf (1&2) lease blocks are contingent on the development of in situ gasification, which is not likely to proceed before the 1990s. The Bass Trust lease, the largest Federal coal lease ever issued, has poor coal quality, thin seams and a high stripping ratio. Similarly, the Gulf (1&2) lease block does not appear to be commercially minable by conventional techniques because of a high stripping ratio. To date, the lessee has not filed applications to DOE for pilot plant development, and no other plans for development were identified for the near term. The Belco lease is authorized for trade under the provisions of Public Law 95-554.

The reserves on the East Wyodak lease might support an onsite coal conversion plant if integrated with 640 acres of contiguous State coal held by the lessee, but stripping ratios are probably too high to develop a mine for export markets. In addition, the lessee also holds a block of PRLAs on land adjacent

\*See ch. 10 for a discussion of the alluvial valley floor situation at the CX Ranch leases.

to East Wyodak. The lessee has expressed serious intention to bring these reserves into production when more favorable market conditions prevail.

A final environmental impact statement (EIS) was submitted on the Pearl lease after the lessee (Shell Oil Co.) had conducted a comprehensive planning assessment. In spite of such an investment of time and resources, development of this property has been postponed. The amount of lease reserves is marginal and the stripping ratios high. Furthermore, the lease reserves are located in two blocks separated by unleased Federal coal.

### **Undeveloped Leases With Unfavorable Development Potential**

Four leases—Armstrong, Blue Diamond, Gulf (3) and Phillips Creek (2)—have unfavorable development potential and thus unfavorable production prospects, even under strong market conditions. These leases have small reserves, poor property characteristics, and little chance of being integrated with another coal property to form a logical mining unit. The owners of these leases have given no indication that they will be developed. The Armstrong and Gulf (3) leases are authorized for trade under the provisions of Public Law 95-554.

## **Development Potential and Production Prospects of PRLAs in the Powder River Basin**

There are 58 PRLAs in the Powder River basin covering a total of 95,228 acres and including recoverable reserves ranging from less than 30 million tons to over 180 million tons. Table 64 presents information on the development potential and production prospects of these 58 PRLAs that are grouped into 19 blocks using the criteria of contiguity and common ownership applied to undeveloped leases. Acreage and reserve ratings are also presented for each block. 1994 is the key year for which to assess the production prospects of PRLAs because the stated policy of the Department of the Interior (DOI) is to process all outstanding PRLAs by December 1, 1984 (43 CFR 3430.3-1(a)). If this schedule is met, diligence requirements for all PRLAs will have to be met by 1994 at the latest. \*

None of the PRLA blocks with large recoverable reserves appears to have favorable development potential. The three PRLA blocks with favorable development potential cannot contribute substantially to the capacity of mines with Federal leases in the Powder River basin because of their small reserves.

\*These leases will be subject to post-FCLAA diligence requirements.

The PRLA blocks that might increase Federal mine capacity substantially in the basin—Peabody (P4), and Consol (1) and (2)—have uncertain development potential and production prospects.

### **PRLAs With Favorable Development Potential**

Only three PRLA blocks (four PRLAs) of the 19 PRLA blocks (58 PRLAs) in the Wyoming portion of the Powder River basin have favorable development potential. None of these blocks would add substantially to the capacity of Federal mines in the Powder River basin. Because of their small size and small recoverable reserves (each with less than 30 million tons), these three PRLA blocks would not have favorable development potential if their incorporation into producing mines or approved mine plans did not seem likely by 1994.

The Peabody (P2) PRLA, may be incorporated into Carter Mining Co.'s Caballo Mine because it is located within the boundaries of the mine area. The Weld-Jenkins (5) PRLA, with only 80 acres, could be integrated into

**Table 64.— Production Prospects for PRLAs: Powder River Coal Basin**

Development prospects	Owner/parent company	Number of PRLAs	County	Acreage	Reserves (millions of tons)	Production prospects (1994)
<b>PRLAs with favorable development potential:</b>						
Peabody (P2)	Peabody Coal Co.	1	Campbell	520	S	Favorable (a)
Weld-Jenk-ns (5)	Weld-Jenkins	1	Campbell	80	S	Favorable (a)
North Antelope (1)	North Antelope Coal	2	Campbell	240	S	Favorable (a)
Totals		4		840	15	
<b>PRLAs with uncertain development potential</b>						
Peabody (P4)	Peabody Coal Co.	1	Converse	835	LM (4.0) <sup>4</sup>	Uncertain (b,c)
Consol (1)	Consolidation Coal Co.	3	Campbell	5,610	L (7.0)	Uncertain (b,c)
Consol (2)	Consolidation Coal Co.	2	Campbell	4,534	L (8.5)	Uncertain (b,c)
North Antelope (2)	North Antelope Coal	2	Campbell & Converse	1,240	s	Uncertain (d)
Arco (1)	ARCO	1	Campbell	357	s	Uncertain (d)
Arco (2)	ARCO	2	Campbell	240	s	Uncertain (d)
Peabody (P3)	Peabody Coal Co.	4	Campbell	2,200	LM	Uncertain (d)
Western Fuels (1) (Stevens North)	Western Fuels Assoc.	3	Converse	8,864	HM <sup>1</sup>	Uncertain (d)
Dixie (2)	Dixie Natural Resources	1	Converse	2,276	LM	Uncertain (c,e)
Thunderbird	El Paso Coal Co.	12	Campbell & Johnson	23,928	S <sup>2</sup> , L <sup>3</sup>	Unfavorable (f)
Weld-Jenkins (I-4)	Weld-Jenkins	13	Campbell & Johnson	28,496	NSR	Unfavorable (f)
Totals		44		78,580	1,400	
<b>PRLAs with unfavorable development potential</b>						
Consol (3)	Consolidation Coal Co.	2	Campbell	3,640	LM	Unfavorable
Dixie (1)	Dixie Natural Resources	1	Converse	800	NSR	Unfavorable
Peabody (Pi)	Peabody Coal Co.	4	Campbell	3,388	S	Unfavorable
Peabody (P5) (Dull Center)	Peabody Coal Co.	2	Converse	3,628	S	Unfavorable
Western Fuels (2)	Western Fuels Assoc.	1	Converse	4,352	NSR	Unfavorable (f)
Totals		10		15,808	127	

**Key to production prospects.**

- a = favorable if Integrated into existing LMU (in which case production of total LMU will count toward diligence requirements)  
b = production contingent on onsite development (synfuels and/or steam)  
c = possible procedural irregularities and/or overlapping mining claims.  
d = favorable if issued (possible procedural irregularities and/or overlapping mining claims) and if integrated into existing LMU.  
e = possibility exists for local Industrial use of the coal  
f = possibilities exist for in situ gasification.

<sup>1</sup>Reserves with stripping ratio less than 3.5 are probably small.

<sup>2</sup>Small surface reserves.

<sup>3</sup>Large underground reserves.

<sup>4</sup>Numbers in parentheses indicates potential mine capacity, if lease is issued.

SOURCE Office of Technology Assessment

**Key to reserve ratings:**

- S = small reserves (zero to 30 million tons)  
LM = low to medium reserves (30 million to 100 million tons)  
HM = high to medium reserves (100 million to 180 million tons)  
L = large reserves (over 180 million tons)  
NSR = no surface reserves

SunEDCo's Cordero Mine. The North Antelope (1) PRLA will likely be developed with Peabody's North Antelope lease. Peabody has contractual commitments on the North Antelope lease with System Fuels for 180 million tons of coal beginning in 1985.

### PRLAs With Uncertain Development Potential

Eleven PRLA blocks (44 PRLAs) covering 78,580 acres have uncertain development potential. Because of their limited reserves, the development of the North Antelope (z), Arco

(1), Arco (2), and Peabody (P3) PRLA blocks is contingent on their being integrated with mines already in production. Development of the Western Fuels (1) PRLA is contingent on integration into the Dave Johnston Mine. This PRLA block has thin seams, a high stripping ratio, and the coal is of low heat content. Procedural irregularities may impede the processing of these PRLAs and their issuance as leases. The Dixie (2) PRLA would have had unfavorable development potential because of small reserves, thin seams, and low heat content of the coal but there is evidence of plans to develop the lease for local industrial use.

The production of coal from the Peabody (P4), Consol (1), and Consol (2) PRLAs is contingent on onsite development. The reserves associated with the Peabody (P4) block could support an onsite steam electric plant but are insufficient to support a synfuels project. Both the Consol (1) and Consol (2) blocks could support either an onsite steam/electric plant or an onsite synfuels plant. The issuance of leases on all three blocks maybe impeded by overlapping mining claims and/or possible procedural irregularities. These PRLA blocks might produce coal if the electrical growth rate and/or demand for synthetic fuels is higher than suggested by several estimates. Consequently, even if these PRLAs are issued as leases, their production prospects would be uncertain for 1994.

The Thunderbird and Weld-Jenkins (1-4) PRLA blocks also have uncertain development potential because their production pros-

pects are contingent on in situ gasification, a technology that is not likely to be commercially viable by 1984. \*

### **PRLAs With Unfavorable Development Potential**

Five PRLA blocks (10 PRLAs) have unfavorable development potential. Four of these PRLA blocks have small reserves. The fifth block, Consol (3) PRLA has unfavorable development potential because it is separated into four noncontiguous blocks by unleased Federal coal.

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\* Preference right lease applicants must demonstrate the existence of commercial quantities of coal before a lease can be issued. Technology for in situ gasification would have to advance to the point of reasonably expected commercial viability by 1984 (the deadline for processing PRLAs) for coal reserves that are suitable only for in situ gasification to meet the commercial quantities test. This is unlikely, given the current experimental nature of this technology in the United States.

## **Comparison of Demand and Supply Projections for the Powder River Basin**

As shown in figure 37 and discussed earlier in this section, most demand projections for Powder River basin coal for 1990 range between 163 million tons per year and 275 million tons per year. The Wyoming task force projected a demand for 206 million tons per year by 1990 for coal produced in the Powder River basin. Production projections for Powder River basin coal can also span a wide range, from existing contracts with developed mines to full utilization of the mine design capacity of existing and planned mines. Figure 37 compares planned production and capacity for 1990 with demand estimates for 1990.

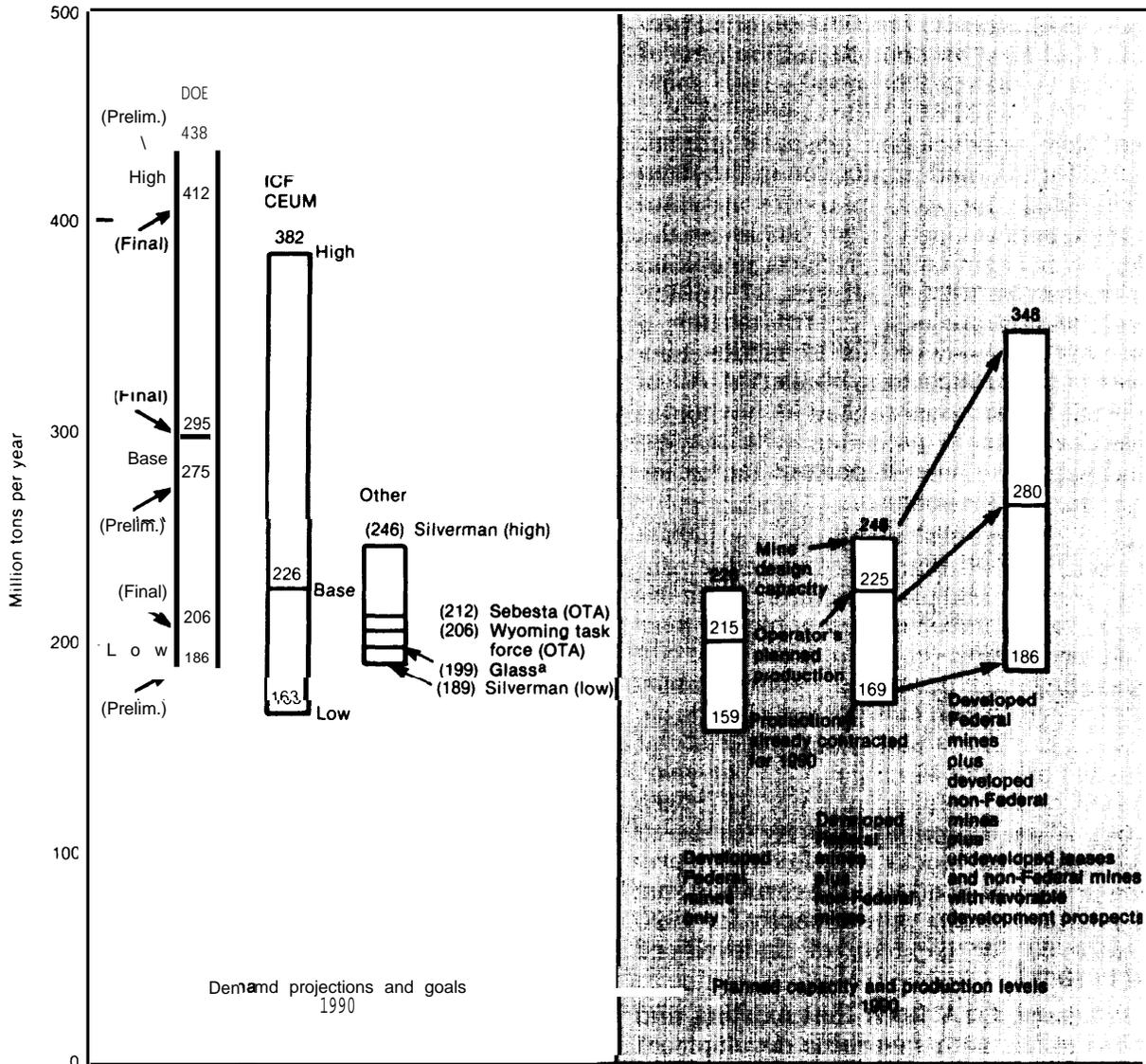
It should be recalled that the estimates of potential production developed in this chapter are not forecasts of the coal that would be produced at a given price or a given demand. They are estimates of the total amount of coal that could be produced from operating Federal mines and from those Federal 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 the levels of potential production, then not all the Federal leases that could technically and economically be developed will go into production.

The existing contracts for delivery of Powder River basin coal in 1990 from operating Federal and non-Federal mines total 169 million tons (see tables 58 and 61). An additional 17 million tons has also been contracted for 1990 from three undeveloped lease blocks (Antelope, North Antelope, and Rochelle), of which 6 million tons is for synfuels (Rochelle). Thus, there is a total of 186 million tons per year of Powder River basin coal already contracted for 1990.

The planned production of the lessees for 1990 is larger than presently contracted pro-

Figure 37.—Comparisons of Powder River Basin Demand Projections With Planned Capacity and Production Levels for 1990



<sup>a</sup>Calculated by adding Sebesta's figure for the Montana portion of the Powder River Basin (88 mmt) to Glass' figure for the Wyoming portion (133 mmt)

References

ICF: CEUM: Coal Electric Utility Model Forecasts and Sensivity Analyses of Western Coal Production, prepared for Rocky Mountain Energy Co (Washington, D.C.: ICF Inc., November 1980)

Sebasta: Demand for Wyoming Coal 1980-1991 Based Upon Projected Utility Coal Market and Demand for Montana Coal 1980-1991 Based Upon Projected Utility Market (Washington, DC.: OTA, October 1980).

Wyoming task force: Result of deliberations of the OTA Wyoming task force, Cheyenne, Wyo., October 1980.

Silverman: Preliminary results from A. Silverman, University of Montana, Missoula, Private communication to OTA,

Glass: Wyoming Coal Production and Summary of Coal Contracts (Laramie, Wyo.: Wyoming Geological Survey, 1980)

DOE: Preliminary National and Regional Coal Production Goals for 1985, 1990, and 1995 (Washington, O. C.: DOE, Aug. 7, 1980). See also: Analysis and Critique of the Department of Energy's August 7, 1980 Report Entitled: "Preliminary National and Regional Coal Production Goals for 1985, 1990, and 1995, prepared for the Rocky Mountain Energy Co. (Washington, D. C.: ICF Inc., October 1980).

DOE: The 1980 Biennial Update of National and Regional Coal Production Goals for 1985, 1990 and 1995 (Washington, D. C.: DOE, January 1981).

duction for 1990. For operating and permitted Federal mines, the sum of the lessees' planned production for 1990 is about 215 million tons. (See table 58 for 1991 planned production.\*) At least another 10 million tons of production is planned by non-Federal mine operators (see table 61). When potential production from undeveloped leases is added, the figure for planned production in the Powder River basin for 1990 increases substantially. Ten undeveloped lease blocks in the Powder River basin could produce 55 million tons per year by 1990.\*\* Of this, 17 million tons per year is presently contracted for; 6 million tons per year of this 17 million tons per year is committed to synfuels. \*\*\* All of these lease blocks were ranked as having favorable development potential, with market demand being the most important factor for their production prospects.

Most of the lessees' plans call for higher production in 1990 than what is under contract at present, and planned mine design capacity is, in a number of cases, higher than planned production. Planned mine capacity for operating and permitted Federal mines for 1990 is 226 million tons per year (see table 58). Planned mine capacity for non-Federal mines adds another 44 million tons per year, for a sum of 271 million tons per year (see table 61). When estimated capacity for the 10 undeveloped lease blocks with favorable production prospects is added, the resulting sum is 348 million tons per year capacity for 1990 (see table 63 for capacity of undeveloped leases in 1991).

In summary, OTA finds that existing and proposed mines with favorable development potential in the Powder River basin could sustain production of 348 million tons per year in 1990, provided the demand existed; only 6 million tons per year of this production is committed to synfuels development. This

\*Note that these tables refer to 1991 production; the numbers in the text above refer to 1990 production, which is slightly less.

\*● Antelope, North Antelope, South Rawhide, Rochelle, Dry Fork, E. Gillette Federal, N. Rochelle, CX Ranch (Consol), CX Ranch (PKS), Wildcat. The 1990 production is 10 million tons less than potential production in 1991.

\*\*Peabody Coal Co.'s Rochelle lease block production is contracted to the Panhandle Eastern project.

figure is substantially larger than most demand projections: over 25-percent higher than the DOE midlevel projection, over 50-percent higher than the ICF midlevel projection; nearly 70-percent higher than the Wyoming task force projection; and 75-percent higher than the projection of the Wyoming Geological Survey.

There are several reasons to suppose that the DOE midlevel projection is outside of the "most likely" range. (See discussion surrounding fig. 34.) A more reasonable "likely high" figure is the ICF base case of 226 million tons per year. Similarly, the ICF low projection of 163 million tons per year, which is less than present contracts for Powder River basin coal, is probably outside of the "most likely" range. Assuming that the "most likely" demand range is from 199 million tons per year (Glass; Wyoming Geological Survey) to 226 million tons per year (ICF base case), then potential mine capacity in the Powder River basin in 1990 may be from 122 million tons per year (over 50 percent) to 149 million tons per year (75 percent) above demand.

### Potential Coal Mine Capacity in the Powder River Basin in the 1990's

The earlier sections of this chapter have discussed capacity, production and demand in the Powder River basin up to 1991. This section briefly examines the additional capacity that might be developed in the 1990's. Only capacity that can be sustained without additional leasing of Federal coal is included.

Table 65 lists all Federal and non-Federal coal properties that might produce in the 1990's and the capacity levels that their presently held reserves could support. For those coal properties likely to be in production by 1991, a total of about 26 million tons per year capacity over 1991 capacity could be added in the 1990's as follows:

- zero from Federal mines in currently approved mine plans (compare with table 59);
- about 7 million tons per year from non-Federal mines (compare with table 61);

Table 65.—Planned and Possible Mine Capacities in the Powder River Basin Beyond 1991a

Operating and permitted Federal mines and undeveloped Federal leases with favorable production prospects for 1991		Undeveloped leases with unfavorable production prospects for 1991 and PRLAs		Non-Federal mines <sup>b</sup>	
Name	Capacity	Name	Capacity	Name	Capacity
All operating and permitted Federal mines	226			With favorable production prospects for 1991	51
Undeveloped Federal leases		Leases		Likely to come into production after 1991	
Antelope	12	Lake de Smet <sup>c</sup>	20	Mobil (Johnson Co.) <sup>c</sup>	11
North Antelope	5	East Wyodak <sup>c</sup>	7	Whitney <sup>d</sup>	1
South Rawhide	12	Pearl <sup>e</sup>	2	Absaloka (II) (Mt)	10
Rochelle	11	Total (leases)	29	Tanner Creek <sup>f</sup>	24
Dry Fork	15			Tongue River II (Mt) <sup>g</sup>	10
East Gillette Federal	15	PRLAs		Tongue River III (Mt) <sup>g</sup>	10
North Rochelle	8	Consol (1) <sup>c</sup>	7	Dominy (Mt)	8
Wildcat <sup>c</sup>	10	Consol (2) <sup>c</sup>	8.5	Bear Tooth (Mt)	2
CX Ranch (Consol) (Mt)	8	Peabody (P4) <sup>e</sup>	4	Total	127
CX Ranch (PKS) (Mt)	4	Total (PRLAs)	20		
Total	326	Total leases plus PRLAs	49		

<sup>a</sup>see tables 58, 81, 63, and 84 for 1991 capacities. (Mt) means mine or lease is in Montana.

<sup>b</sup>In Wyoming, capacities of proposed mines that are not associated with existing Federal lease from various sources (primarily Coal Age, 1981, DOE, 1979, and DOE, 1981) total about 67 million tons. However, closer evaluation of these mine proposals indicates that about 40 million tons of this capacity depends on new leasing of Federal coal and that in several other instances listed capacities exceed the sustainable levels of production when the mine reserves are considered. Mines listed here are only those mines and potential levels of production that could reasonably be expected to occur without new leasing of Federal coal. Capacities listed here were developed in consultation with Gary Glass, Wyoming Geological Survey, Laramie (phone conversation, May 18, 1981).

<sup>c</sup>Production is contingent on onsite development for power generation and/or synthetic fuels.

development at this site is unlikely because of problems with alluvial valley floors, but reserves may qualify for exchange for unleased Federal Coal under provisions in the Surface Mining Control and Reclamation Act of 1977.

<sup>d</sup>High stripping ratios and noncontinuous reserves give this lease unfavorable production prospects in 1991, but the lessee, Shell, has developed a mine plan and wants to keep options open for possible development at a later date. Undeveloped leases with unfavorable development potential are not listed here.

<sup>e</sup>Shell has an option to lease reserves in the Tanner Creek area on the Crow reservation, provided Shell can find a market for the coal.

<sup>f</sup>Development of the Montco and Tongue River mines in Montana is contingent on construction of the Tongue River Railroad. All these mines could also be affected by the Tongue River unsuitability petition. A larger list of nonfederal mine capacities in Montana (i.e., mine proposals not associated with existing Federal leases) compiled from various sources (see sources for table 86 and table A.3.1, vol. II Wyoming task force report) total about 84.4 million tons, excluding the Fort Union region.

SOURCE: Coal Age, 1981, "New Coal Mine Development and Expansion Survey 1980-1989," Coal Age, February 1981. Department of Energy, 1979 *Western Coal Development Monitoring System: A Survey of Coal Mine Capacity in the West*, DOE/TIC-10249 (Washington, DC.: DOE, April 1979). Department of Energy, 1981 *Western Coal Survey A Survey of Coal Mining Capacity in the West*, DOE/RA-0045/1 (Washington, D. C.: DOE, January 1981). Western Coal Planning Assistance Project, 1979 *Fact Book for Western Coal/Energy Development*, prepared for Missouri River Basin Commission (Billings, Mont.: Mountain West Research, Inc.).

and

- about 19 million tons per year from undeveloped leases (compare with table 63).

For those coal properties unlikely to be in production by 1991, a total of about 125 million tons per year of capacity could perhaps be put in place in the 1990's as follows:

- about 29 million tons per year from three undeveloped leases (compare with table 63);
- about 20 million tons per year from three PRLAs (compare with table 64); and
- about 76 million tons per year from non-Federal mines.

Therefore, an increase of about 150 million tons per year of mine design capacity over 1991 capacity could perhaps become avail-

able in the Powder River basin in the 1990's without additional leasing of Federal coal, giving a possible total post-1990 capacity of about 500 million tons per year. This amount should be considered an upper limit rather than a likely value of post-1990 capacity without additional leasing of Federal coal. About 70 million tons would be suitable only for on-site development for synfuels or power generation.

For the post-1990 period, demand projections become very uncertain. The DOE preliminary midlevel production goals, the ICF CEUM midlevel production forecast and the DOE midlevel final production goals for 1995 for the Powder River basin are 382, 306, and 491 million tons per year, respectively. The DOE final production goal, 491 million tons per year, reflects several policies about in-

creased coal use, notably a very large demand for coal for synfuels, that cause the number to be higher than other forecasts. Although all demand projections past 1990

should be regarded as very uncertain, the lower numbers above are, as of now, more likely to be realized.

## Implications for New Leasing

Because of the predominance of Federal coal reserves in the West, the decisions of DOI on the quantity, location, and timing of coal leasing are important not only to the Nation in terms of energy availability, but to the region with regard to regional and community development, revenues, and environmental disturbance. There are two distinct philosophies advanced to govern the leasing of Federal coal: 1) a free market approach based on the theory that demand for leases should regulate the rate of leasing, and that the Federal Government should offer leases for development to the extent the market can absorb; and (z) an approach that emphasizes leasing coal at a rate that will ensure that coal production can meet the anticipated demand after considering possible errors in demand projections and delays that might occur in developing the leased reserves. The objective of the second approach is to offer enough coal to meet the projected supply-demand estimates, allowing a moderate margin in excess to meet contingencies for delayed development, underestimates in demand or unforeseen constraints on production. DOI has adopted both of these philosophies at various times in the past,

Because of the leadtime required from the acquisition of reserves to full production, the decisions on the amount, type, and location of coal to be offered for leasing must be made more than a decade in advance. Leasing targets have been based on projected estimates of coal demand, projected estimates of industry's production capacity, environmental considerations, and the potential impacts on the social and economic structure of the coal regions. Because leasing targets are based on forecasts and projections, which in turn rely on assumptions and estimates of production

factors and projected demands, there are significant uncertainties in setting the quantities and timing of leasing targets. Experience suggests that supply-demand forecasts are subject to significant errors when extended beyond 5 years, and uncertainties become substantial in projections beyond a decade. (See ch. 5, Markets, for a discussion of these factors.)

Some of the uncertainties that may influence the supply and demand for Western coal during this decade are: Will electricity demand growth remain at current low levels? How rapidly will foreign exports of Western coal grow during next two decades? How rapidly and to what extent will the conversion from oil and gas to coal take place? To what extent will rising transportation costs restrict the market areas for Western coal? Will synthetic fuels development place substantial demands on the Western coal region? To what extent will the mandatory scrubbing requirements of the Clean Air Act restrict demand for Western coal? Will there be unforeseen delays in mine development and the attainment of full production capacity?

Both those who advocate large-scale renewed leasing of Federal coal lands and those who oppose renewed large-scale leasing as being unnecessary at this time use supply-demand projections and the potential of current leased reserves as arguments to support their respective positions. The disagreements between these two groups are based on:

1. differences in what constitute reasonable projections of demand for Western coal;
- z. differences in estimates of the time required for bringing a mine into produc-

- tion at full capacity;
3. differences over the acceptable levels of leased reserve inventories needed by an operator to ensure competitiveness; and
  4. differences concerning the safety margins in leased reserves needed to meet contingencies for higher-than-predicted demands or to meet shortfalls in supplies from other regions.

Many industry representatives discount the efficacy of leasing targets altogether. They subscribe to the philosophy that public resources should be freely available to the private sector for development in accordance with the demands of the marketplace. As one spokesman for this philosophy puts it, "the level of leasing can be safely left to those who can be punished economically by errors in judgment and rewarded by sound forward thinking." However, industry agrees that reasonable performance standards and environmental protection standards are necessary to prevent irreversible damage to the environment and the socioeconomic structure of the communities.

### Background

Under the leasing program adopted by the Carter administration, coal leasing targets are established in a three-part process: DOI, which has primary responsibility for administering the coal leasing program on Federal lands, uses DOE regional coal production goals as a point of departure. Preliminary leasing targets established by DOI are then reviewed by Regional Coal Teams, which adjust the target based on public comments and the position of the affected States represented on the team. The Secretary of the Interior then approves a specific coal leasing target after reviewing the options presented in a Secretarial Issue Document (SID). The Secretary may select one of the suggested options or substitute one of his own.

DOI has changed its basis for determining leasing targets several times with respect to DOE regional coal production goals. DOI originally used the 1987 medium production goals increased by 25 percent for contingencies.

Subsequently, DOI adopted DOE's midlevel production goals for 1990 but these were later supplanted for the powder River basin by the 1990 high production goals. DOI is currently considering deemphasizing the DOE's production goals, and using them as just one factor in lease sale planning. In place of total reliance on these production goals, DOI may adopt an approach that would allow primarily the market demand for leases to determine when and where and at what level lease sales would be held. In order to simplify and expedite the leasing process, consideration is also being given to revising the planning process to defer the determination of mining suitability and other land use planning functions until after leasing. DOI is considering working towards having an inventory of reserves under lease that could support levels two to four times anticipated production, similar to the customary practices of the industry.

In making the decision to use the 1990 high production goals of DOE for the Powder River basin lease sale, DOI acknowledges that currently planned production will exceed demand through 1990. The new Federal coal management program was implemented in June 1979, and will not be fully operational until 1984 at the earliest. One lease sale was held in January 1981, in the Green River-Hams Fork region. Other regions selected for early leasing include:

1. the Powder River basin;
2. Uinta-Southwestern Utah; and
3. Southern Appalachia.

The lease sale in the Powder River basin is scheduled for early 1982. Since the decision to hold start-up lease sales was announced, some have expressed doubts about the necessity of the 1982 sale in the Powder River basin to meet reasonably anticipated demand in the 1990's given the leases outstanding, available private coal reserves and industry's present overcapacity in the Powder River basin.

OTA estimated that presently operating and proposed new mines in the Powder River

basin, both Federal and non-Federal, would have a total mine design capacity of 350 million tons of coal annually by 1990. (See fig. 37 and tables 58, 61, and 63. ) This contrasts with OTA's "most likely" demand for Powder River basin coal, which was estimated to be between 200 million tons and 226 million tons in 1990. (See this chapter, pp. 171-173 and ch. 5, pp. 100-108.) DOE's interim midlevel production goal for 1990 is 275 million tons per year—significantly higher than OTA's "most likely" range. DOE's final midlevel production goal is even higher—295 million tons. The final high level production goal for 1990, which is the basis for the Powder River basin coal sale, is 412 million tons per year.

On June 25, 1981, DOI announced that it had selected a coal leasing target of 1.4 billion to 1.5 billion tons of reserves for the Powder River basin to be considered along with alternative levels analyzed in the regional EIS. This target was recommended by the regional coal team; however, at the time the target was announced, the Assistant Secretary for Land and Water Resources commented that:

I am apprehensive about setting a leasing target that is too low, that would hinder operation of the market, and that would result in an insufficient amount of coal being leased to satisfy the demand for reserves in the region.<sup>4</sup>

The Secretary of the Interior, at the time he makes the final determination on the Powder River basin lease sale, could decide to lease up to 2.5 billion tons of reserves in the region. Currently leased coal reserves in the Powder River basin total 9.2 billion tons.

Existing leases in the Powder River basin include over one-half of the 16.5 billion tons of Federal coal reserves presently leased. With the additional leases scheduled for 1982, the Powder River basin has become the focus for debate over the timing, pace, and extent of Federal coal leasing needed to meet the future energy demands of the Nation.

Those opposed to renewed leasing in the

<sup>4</sup>Department of the Interior, News Release, June 25, 1981.

Powder River basin cite the potential for overcapacity in the early 1990's as the main reason why large-scale leasing scheduled for 1982 should be deferred until, perhaps, 1985. \* But given the necessary leadtime to develop a large new mine and reach full production, new leases sold in 1985 could not confidently be expected to reach full capacity until 1995. By 1995, the excess capacity probable in the early 1990's may have been substantially reduced and possibly have disappeared. Estimates of potential capacity and demand in the post-1990 period are considerably less reliable than similar estimates for 1990. An additional 155 million tons per year of capacity over the 350 million tons per year of capacity cited above could perhaps become available in the post-1990 period from some undeveloped Federal leases, PRLAs and new non-Federal mines (see table 65).

About 70 million tons per year of the additional post-1990 capacity would be suitable only for onsite development for synfuels or steam electric use because of low coal quality. Therefore, the 155 million tons per year should be considered an upper limit rather than a likely value of additional post-1990 capacity without additional leasing of Federal coal. For the post-1990 period, demand projections are very uncertain.

The ICF CEUM<sup>5</sup> midlevel production forecast, the DOE preliminary midlevel production goals, and the DOE midlevel final production goals for 1995 for the Powder River basin are 306, 382, and 491 million tons per year, respectively. The DOE final production goal, 491 million tons per year, reflects several policies about increased coal use, e.g., coal for synfuels, that cause the forecast to be higher than others. Although all demand projections past 1990 should be regarded as very uncertain, the lower numbers above are, as of now, more likely to be realized,

\*The debate focuses on large-scale leasing. Leasing in special circumstances, e.g., to maintain production or to avoid bypassing a small area of Federal coal that could not subsequently be economically mined, engenders far less controversy.

<sup>5</sup>Coal Electric Utility Model Forecasts and Sensitivity Analyses of Western Coal Production, prepared for Rocky Mountain Energy Co. (Washington, D. C.: ICF, Inc., November 1980).

The pros and cons of the proposed Federal leasing schedule are discussed in the following sections, using the Powder River basin as a case example.

### The Case in Support of Large-Scale Leasing in the Near Future

Proponents of “start-up” leasing and full-scale leasing programs in the near future cite four basic reasons for their position:

1. to be able to compensate for the contingencies of increased demand or shortfalls in supply;
2. to ensure competition;
3. to provide additional reserves for production in the post-1990s to accommodate the 10 year (or longer) leadtimes needed to achieve full production;\* and
4. to allow entry of operators not now active in the Powder River basin for equity and to stimulate competition.\*\*

Proponents of immediate Federal leasing contend that leasing targets should be geared to allow margins for unanticipated increases in demand or unforeseen shortfalls in production because of the failure of some planned capacity to come on line. For example, if only 6 out of the 17 undeveloped properties contributing to the 350 million tons per year of capacity in 1990 should fail to be developed, capacity in that year could be reduced by as much as 60 million tons per year, to 290 million tons per year. Moreover, the “most likely” demand range for Powder River basin coal in 1990 of 200 million to 225 million tons per year implies a midrange estimate based upon judgments of reasonable expectations.

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\*Estimates of the time required after lease sale to achieve full production for a large surface mine range from under 10 years to more than 15 years. The upper range reflects a conservative view of the time needed to scale up to full production after production has commenced; the lower range arises in part from the belief that permitting times will become shorter as mine operators and Government regulators alike develop more familiarity with the permitting process.

\*\*There are 38 lease blocks in the Powder River basin containing 73 leases. There are 19 lessees: 11 oil companies, 3 utilities, Peabody Holding Co., and four others (see app. B, OTA Working Lease List).

The 1990 demand for Powder River basin coal could be somewhat higher than OTA's “most likely estimate” if several events were to occur:

- if electrical demand grew faster than anticipated;
- if boiler conversions from oil and gas to coal occurred more rapidly than expected;
- if synthetic fuels development came on-line faster than projected;
- if foreign export of coal grew more rapidly than anticipated; or
- if Powder River basin coal captured an even larger share of the domestic market than anticipated.

Leasing proponents claim that underleasing would have a substantial impact on the coal markets and would drive up market-clearing prices and force shifts in production to other regions. However, opponents of leasing consider it improbable that coal demand will increase significantly beyond the “most likely” demand projections. They further hold that even if demand increased somewhat or some shortfalls in production developed, these would not be large and the capacity and resources in other regions, including Midwestern coal, could easily make up the difference.

Currently operating Federal and non-Federal mines in the Powder River basin have a planned capacity of 246 million tons per year in 1990. (See tables 58 and 61 (including footnote a) and fig. 37.) Most of the currently operating Federal mines would be operating in 1991 at or near full design capacity. Any demand for Powder River basin coal over the 246 million tons per year level would have to be met by presently undeveloped Federal leases and undeveloped non-Federal coal properties. Some proponents of immediately renewed leasing do not consider the potential of the undeveloped leased lands as certain enough to provide a secure safety margin of production in 1990 in light of the leadtime required from lease sale to full production,

A second consideration advanced in support of additional Federal coal leasing in the powder River basin is the potential for stimulating competition within the coal industry. Both the Department of Justice (DOJ) and the General Accounting Office (GAO), in reports issued in 1980, criticized the setting of lease targets as being inefficient and potentially anticompetitive because targets attempt to match the amount of Federal coal leased to the amount required to meet given projected demand. \* DOJ'S report concludes that a target leasing system unduly supplants the marketplace as the allocator of coal resources. The report presents two solutions: 1) abandon the setting of targets, and begin leasing on demand, or 2) set lease targets at a level far in excess of the more modest leasing targets used earlier. DOJ has previously contended that doubling or tripling the current targets would be necessary to provide a reasonable margin for error and to promote competition. DOJ also recommends the reevaluation of leasing targets to determine whether it would be preferable simply to lease what industry desires. DOI is currently considering deemphasizing leasing targets in favor of the free market approach as suggested by DOJ. Moreover, the adoption by DOI of DOE high production goals for 1990 for the Powder River basin is consistent with DOJ's second recommendation to provide liberal targets much larger than the one to one production-demand ratios used for lease planning earlier.

However, opponents of near-term large-scale leasing in the Powder River basin contend that the excess in potential capacity in the Powder River basin could ultimately lead to a decrease in competition within the region. Most of the current leaseholders in the Powder River basin are large companies that can afford to take short-term losses; smaller leaseholders or new entrants who may not have large amounts of capital might find it difficult to compete in this situation. This factor is also a cause of concern to some smaller

companies that nevertheless support early leasing in the Powder River basin.

DOE has recently analyzed Federal coal leasing activities. One important factor DOE considered was the effect of leasing on the conditions for entry into the coal industry. Insofar as easy entry into the industry affects prices and output as a result of stimulating potential competition from new entrants, it is an important factor in assessing the competitiveness of the industry. For regions such as the Powder River basin, where future mining will depend in large part on the availability of Federal coal, the DOE report found that severe limitations on the availability of Federal coal for lease could create an artificially high barrier to entry as well as shifting substantial market power to present industry participants. In general, new leasing is one method of improving entry conditions, and increasing the number of producers. However, the extent to which the lease sale scheduled for the Powder River basin is likely to increase the number of lessees is unclear because: 1) some present lessees might have an advantage over new entrants in assembling large minable tracts because of their existing leases; 2) other present lessees with large reserves in the Powder River basin might not care to increase their holdings; and 3) the number of tracts to be offered for lease is not yet known.

The third factor cited by those advocating immediate renewed leasing of Federal coal is the need for creating a pool of reserves well in advance of planned production to allow for strategic planning by the industry and to accommodate the 10-year (or longer) leadtime from lease sale to full production.

For flexibility, industry prefers to operate on a reserve base that could support two to four times the anticipated production. Also, industry contends that any leasing targets should be geared to meet the maximum possible demand for coal that could occur within a 15- to 20-year planning horizon. Leasing opponents, on the other hand, believe that such long-range planning and reserve pools are not necessary. They contend that if demand is monitored closely, then leases can be offered when demand trends suggest the need will develop in 10 years or so.

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\*U.S. Department of Justice, Antitrust Division, *Competition in the Coal Industry*, November 1980; U.S. General Accounting Office, *A Shortfall in Leasing Coal From Federal Lands: What Effect on National Energy Goals?* EMD 80-87, Aug. 22, 1980.

If DOI were to eliminate leasing targets as the determining factor in its coal lease planning in favor of a market-oriented program for leasing on demand, the market response still may not result in leasing of reserves that could support production substantially in excess of demand (“overleasing”). Moreover, proponents of a liberal leasing policy or leasing on demand claim that overleasing would not lead to production of coal in excess of demand. The proponents reason that if markets do not exist, the lands would not be developed and therefore socioeconomic impacts and environmental impacts because of additional leasing would not occur.

Those opposing the 1982 Powder River basin lease sale admit that demand uncertainties must be considered in coal leasing planning, but they reject many of the projected demand scenarios as being “extreme assumptions. For example, the DOE final midlevel production goal of 295 million tons per year for the Powder River basin in 1990 includes about 35 million tons per year for synfuels feedstock; this is unlikely to be achieved. A more likely number is under 10 million tons per year in 1990. To remedy the uncertainties in long-range demand forecasts and attempt to bring targets closer to “reasonable” demand expectations, a tracking system has been suggested to improve the accuracy of demand projections as DOI moves closer to coal leasing target dates. Demand projections depend on a number of assumptions concerning electrical growth rate, transportation costs, and other factors. If in 1982 or 1983 the actual electrical growth rate or transportation costs differ significantly from those used to bracket the likely demand range earlier, then the likely range of demand for a given year could be modified with increasing confidence.

The prospect of leasing on demand or using liberal leasing targets raises the question of speculation. Unlike the situation during the previous era of liberal leasing, actual production requirements for diligent development now exist in the Federal Coal Leasing

Amendments Act and regulations. \* If the demand for Western coal does not increase as rapidly as liberal leasing proponents generally assume, the diligent development requirements could act as a damper on acquiring leases purely for speculation.

Opponents of a liberalized leasing program claim that Federal “overleasing” would reduce the revenues from private, State, and Indian coal because of the predominance of Federal coal in the region and the pressures that this coal would place on the local markets. They also claim that “overleaping” would depress the bids on new leases to the point where the public would not receive a fair return for its resources.

### The Case for Postponing Leasing

Those opposing renewed Federal coal leasing in 1982 in the Powder River basin cite three reasons for deferring the lease schedule:

1. the currently operating Federal and non-Federal mines, plus the good quality properties being actively developed and the PRLAs that may be developed in the future will provide substantially more capacity than will be needed between 1990 and 1995;
2. slower leasing is needed to allow sufficient time for adequate planning for leasing by DOI; and
3. slower leasing would better match the capability of the State, regional, and local governments to deal with the socioeconomic impacts of development,

Regarding existing and planned overcapacity, those who favor reconsideration and delay of the 1982 leasing schedule in the Powder River basin cite the finding that the capacity of currently operating mines combined with potential capacity from undeveloped Federal and non-Federal properties that

\*101 is considering various proposals to present to DOI; to liberalize the diligence requirements for leases issued prior to August 1976.

have favorable development potential could reach 350 million tons per year in 1990. This would be 125 million tons per year more than OTA's estimate of the "most likely" 1990 demand for Powder River basin coal. Even if only 11 out of the 17 undeveloped coal properties were developed, total design capacity would still be 290 million tons per year. Opponents of renewed Federal leasing in 1982 point out that this tonnage substantially exceeds OTA's likely estimate of 200 million to 225 million tons per year.

If leasing of Federal coal were deferred until 1985, the newly leased properties would not be producing at design capacity until about 1995. As discussed above, available demand projections for 1995 are highly uncertain, and range from 306 million to 491 million tons per year. At this time, the lower portion of this range appears more likely. Leasing opponents consider the overcapacity to be sufficient to provide adequate coal to meet demand through 1995 because they believe DOE's targets reflect unrealizable policy objectives. The difficulty in making sound projections beyond 1990 precludes a definitive resolution of the disagreement on supply-demand between the perceptions of the proponents and opponents of additional leasing in the Powder River basin in 1982.

The prospects for significant production from the PRLAs in the 1990's are more speculative. Processing PRLAs will not be completed until 1984. \* Until the rights of the applicants are determined, there will be little definitive information about ownership, quantity of coal or quality of the resource. Although the full extent of reserves within the PRLAs is not known with certainty, it is estimated that between 35 million and 60 million tons of coal per year may be minable from such lands throughout the West by 1994. Although PRLAs may contribute to future production, it is unlikely that they will add much production within the next 15 years; their contribution to production capacity in the Powder River basin will probably be limited to about

20 million tons per year or less. (See tables 64 and 65.)

Opponents of the 1982 leasing schedule also contend that a delay to 1984 or beyond would allow more time for DOI to prepare environmental baseline studies and permit detailed consideration of the unsuitability criteria that could possibly disqualify some proposed lease blocks. However, recent developments within DOI suggest that under proposed changes in the Federal coal leasing program unsuitability criteria would not be considered in processing PRLAs, and a number of criteria of unsuitability that were applied in the prelease tract selection stage would be deferred until later in the process, e.g., the mine permit stage. Furthermore, it has also been suggested that fewer prelease determinations of the resource base and mining conditions be made and that other planning features be dealt with by the lessee after leasing rather than before. However, both the General Accounting Office<sup>6</sup> and the American Mining Congress have criticized DOI for using inadequate data for land use planning on lease sales.

Those advocating a delay of the 1982 sale also claim that the transitional sale scheduled for the Powder River basin was accelerated to show that coal leasing could resume quickly after the leasing moratorium was lifted and the new Federal coal management program was formulated. Because of this, they suggest, insufficient consideration was given to competitive factors in the selection of leasing tracts. Citing the DOJ report on competition in the coal industry that criticized the leasing program for giving inadequate attention to the pattern of leasing and how existing ownership may influence the competitiveness of upcoming lease sales, opponents of immediate leasing claim that deferral of the 1982 lease sale would permit more time for considering the implication of leasing patterns on competition,

<sup>6</sup>Mapping Problems May Undermine Plans for New Federal Coal Leasing, U.S. General Accounting Office, Dec. 12, 1980.

<sup>7</sup>Charles F. Cook, Vice President, American Mining Congress, "AMC's Recommendations 10 Secretary Watt on Reform of Interior Regulations," memorandum, Feb. 17, 1981.

\*See ch. 9 for a discussion of PRLAs.

Opponents to the 1982 lease sale in the Powder River basin also feel that the large sale will bias the land-use planning process toward mineral development at the expense of other Federal resources and make it more difficult for Federal surface management agencies to apply effectively the principles of multiple-use and sustained yield to manage public resources,

Finally, opponents of the 1982 lease sale in the Powder River basin claim that by deferring the lease sale until 1984, State, county, and local governments could have time to meet the needs of expanded coal development and plan for the socioeconomic impacts that will result. Federal coal leasing decisions in the Powder River basin can have significant impacts on the local communities and the entire region. Many of the socioeconomic impacts of Federal resource development must be dealt with by State, county, and local governments.

Because of the importance of Federal lands within the basin, the decisions of DOI with

regard to coal development will determine, to a large extent, the future of the region, the character of the economy and lifestyle of its residents. Whether the economic growth and social change that will accompany development of Federal coal resources is desirable or undesirable in the context of local and county planning objectives, the Federal Government, according to those opposing accelerated leasing, is obligated to carefully plan and coordinate coal leasing with the capabilities and objectives of the residents of the basin.

Another factor in Federal leasing decisions in the broader sense is to ensure that the benefits and negative impacts of resource development are distributed equitably among the various regions of the country. All of these reasons, according to those favoring delay, can be considered and balanced if sufficient time is given to planning, analysis, and seeking a balance in approaching Federal coal leasing among all coal-producing regions.