JACKFAU-84-315-1

EMPLOYMENT ASSOCIATED WITH A DOMESTIC METHANOL FUEL PRODUCTION INDUSTRY

(FINAL REPORT)

Submitted to:
U.S. Environmental Protection Agency
Office of Mobile Sources
Ann Arbor, Michigan 48105

April 1985

JACK FAUCETT ASSOCIATES

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EPA-420-R-85-108

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EXECUTIVE SUMMARY

This report presents and examines estimates of the level of employment supported by the development of a domestic methanol fuel production industry capable of producing 2.5 million barrels per day (BPD) of methanol from high-sulfur eastern and midwestern coals by 1995. Three types of employment are considered. Direct employment is that attributed immediately to either the construction or the operation of the methanol plants. Indirect employment is due to the purchase of goods and services from different sectors of the economy in support of plant construction and operation. Finally, induced employment occurs as changes in output and employment result in changes in personal income and increased consumption. Direct, indirect, and induced employment will occur during all stages in the development of the industry.

The period considered in this report covers the years from 1985 to 1995, inclusive. Annual employment estimates are calculated for a single scenario. It is assumed that 30 plants, each consuming 25,000 tons of coal per day to provide 85,000 BPD of methanol, will be required to produce 2.5 million BPD in 1995. Six of these plants will come on line in 1990, and six will be added each year from 1991 through 1994. Construction of each plant will take six years, with the last year of construction overlapping with the first year of full operation. Thus, construction of the first set of six plants will begin in 1985, the second set in 1986, and so forth until 1989, when construction of the fifth set will begin. Mining of coal for production of methanol at a specific plant is assumed to begin four years before the plant is fully operational, so that a stockpile of coal is available at the plant. This mining, however, is phased in gradually over that period so that annual coal output does not equal the annual coal requirement of the plant until it is fully operational. Finally, 1995 represents the steady state level of activity, since all construction is completed in 1994 and all plants are fully operational by 1995.

A. SUMMARY OF METHODOLOGY

The primary data required to estimate the direct, indirect, and induced employment supported by a domestic methanol fuel production industry were derived from a detailed coal-to-methanol plant feasibility study performed by Dames and Moore and the Nokota Company for the U.S. Department of Energy. This study (final report - March 1983)

examined the commercial viability of the construction and operation of a coal-to-methanol plant using the Lurgi gasification and methanol synthesis processes.

A preliminary plant design and cost estimate prepared by Fluor Engineers and Constructors, Inc., for Dames and Moore, and a socioeconomic assessment prepared by Dames and Moore, were the most valuable portions of the feasibility study for this analysis. Estimates of direct, per plant construction and operation employment were derived from these analyses, as were construction, mining, and operation schedules. Also developed from the Fluor report were per plant estimates of the dollar value of the inputs, other than coal, into the construction and the operation of the plant.

The dollar values of the inputs were then organized into separate bills of goods for the construction and operation of the plant and, where applicable, for one time startup costs that typically occur during the year prior to full scale plant operation. A separate bill of goods was also developed for the coal input into production. These bills of goods, which are organized by economic sector, are the foundation for estimating indirect employment using a standard Leontief interindustry economic model and a labor demand model. The industry activity model, in combination with the primary inputs estimates, is used to estimate changes in an industry's output due to changes in demand for its product as a result of methanol plant construction and/or operation. When coupled with a labor demand model, changes in demand are translated into estimates of employment associated with that demand.

The models selected to estimate indirect employment were the Bureau of Labor Statistics interindustry model and the Bureau of Labor Statistics labor demand model contained in the Bureau of Labor Statistics Economic Growth Model System. Given estimates of revenue impacts by supplier industry and a plant construction and operating schedule, these models estimate indirect employment in the industries that supply the methanol industry directly, and in the industries that provide goods and services to those primary supplier industries.

Induced employment stems from the expenditure of disposable personal income for the consumption of goods and services by income-earning individuals and their families. These personal consumption expenditures (PCE) may originate from the direct and the indirect employment supported by an industry, or from existing induced employment supported by previous changes in PCE. Thus, total induced employment resulting from

a given initial change in PCE may be divided into several consecutive rounds of induced employment, each round dependent on the level of PCE created by the previous round's employment.

The initial round of induced employment in this study is generated by the personal consumption expenditures of those individuals directly and indirectly employed by the domestic methanol production industry. Given this basis, annual total induced employment was calculated in five steps. First, the effect of the estimated annual levels of direct and indirect employment on disposable income and on personal consumption expenditures (PCE) was forecasted. Second, the change in PCE was distributed across the projected PCE vector embodied in the BLS interindustry model according to the proportions forecasted by the model. Third, the BLS interindustry model and the BLS labor demand model were used to estimate the initial round of induced employment resulting from the change in PCE. Fourth, the ratio of initial induced employment to the sum of direct and indirect employment was used to estimate a total employment multiplier. Fifth, the sum of direct and indirect employment was multiplied by this multiplier to yield total employment. Induced employment was then calculated by subtracting direct employment and indirect employment from this total employment estimate.

B. SUMMARY OF RESULTS

The estimated levels of annual employment supported by the development of a 2.5 million BPD domestic methanol fuel production industry are presented in Exhibit E-1 for the period from 1985 through 1995. The exhibit divides employment into the major phases of the industry's development —construction, operation (including startup), and coal mining — as well as into direct, indirect, and induced employment.

Total employment supported by the industry grows from 107,921 in 1985 to a peak of 666,766 in 1989. It declines thereafter to a steady-state level of 379,050 in 1995. Construction-related employment dominates the period from 1985 through 1990, ranging from a high of 66.7 percent of total employment in 1985 (71,960 jobs) to 40.5 percent in 1990 (257,400 jobs). Induced employment becomes the major employment factor after 1991, totaling 209,920 jobs, or 36.4 percent of total methanol-related employment for the year. Induced employment continues to be the leading sector through 1995.

EXHIBIT E-1:
EMPLOYMENT IMPACTS SUMMARY

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Construction Employment	71,960	155,790	210,412	280,961	328,372	257,400	173,971	118,939	48,635	900	0
Direct	21,000	46,200	63,000	85,200	100,800	80,700	55,500	38,700	16,500	900	0
Indirect	50,960	109,590	147,412	195,761	227,572	176,700	118,471	80,239	32,135	0	0
Operation Employment	0	2,700	9,600	16,500	47,082	66,800	83,552	96,081	108,221	97,639	96,593
Direct	0	2,700	9,600	16,500	24,900	34,500	41,400	44,100	46,800	48,000	48,000
Indirect	0	0	0	0	22,182	32,300	42,152	51,981	61,421	49,639	48,593
Coal Employment	0	5,709	16,902	33,603	56,308	84,206	109,230	125,073	134,639	138,111	135,381
Coal Mining	0	2,671	7,946	15,973	27,268	41,359	55,919	63,912	68,499	69,886	67,688
Other Mine Mouth	0	287	838	1,637	2,663	3,875	4,860	5,551	5,930	6,012	5,802
Other Indirect	0	2,751	8,118	15,993	26,377	38,972	48,451	55,610	60,210	62,213	61,891
Induced Employment	35,961	83,361	122,384	174,970	235,004	227,129	209,920	200,430	176,478	146,600	147,076
Total Employment	107,921	247,560	359,298	506,034	666,766	635,535	576,673	540,523	467,973	383,250	379,050

Construction employment peaks at 328,372 jobs in 1989. This includes 100,800 direct construction jobs (30.7 percent) and 227,572 indirect jobs (69.3 percent). It declines eventually to no jobs in 1995, when all construction has ceased. It is interesting to note that in each year except 1994, indirect construction employment is more than twice direct construction employment.

Operation employment ranges from a low of 0 in 1985, when construction of the first six plants is just beginning, to a high of 97,639 in 1994, when all 30 plants are fully operational. Although full operation of the first six plants will not begin until 1990, it is expected that some direct operation employment begins as early as 1986, when people will be hired to begin training and to start the testing of the plants' systems. Once operations begin consuming inputs in 1989, direct operating employment and indirect operating employment are similar over the remainder of the period, and are almost equal at steady state levels in 1995 (48,000 jobs and 48,593 jobs, respectively).

Employment related to coal mining grows continuously from 5,709 in 1986, when stockpiling begins, to 138,111 in 1994, when all plants are fully operational. It declines slightly in 1995, reflecting gains in productivity. Coal mining employment and other employment at the mine mouth (i.e. transporters and marketers of coal) grow from 2,671 jobs and 287 jobs, respectively, in 1986 to 69,886 jobs and 6,012 jobs, respectively, in 1994. Employment in industries that supply inputs to coal mining grow from 2,751 in 1986 to 62,213 in 1994. Employment again declines in these sectors in 1995 due to productivity gains.

Induced employment totals 35,961 jobs in 1985, peaks at 235,004 jobs in 1989, and declines to a steady-state level of 147,076 in 1995. The ratio of induced employment to the sum of direct and indirect employment ranges from 0.50 in 1985 to 0.63 in 1995, reflecting gains in real per capita personal consumption expenditures over the period.

Employment levels in 1995 represent the steady-state environment for this analysis. Although continued gains in productivity will reduce direct and indirect employment from these projected levels, the decreases will not be significant. Furthermore, gains in real income among these workers after 1995 will lead to larger total employment multipliers and possibly higher levels of induced employment. Thus, it is likely that total steady-state employment associated with a 2.5 million BPD domestic methanol production industry will range between 350,000 and 375,000 jobs after 1995.

C. EMPLOYMENT ESTIMATES IN PERSPECTIVE

The annual total employment estimates projected for a 2.5 million BPD domestic methanol industry comprise less than one-half of one percent of the nation's civilian labor force for all but two years between 1985 and 1995 (see Exhibit E-2). The methanol-related share ranges from a low of less than one-tenth of one percent in 1985 to 0.54 percent in 1989, declining thereafter to a steady-state level of 0.29 percent in 1994 and 1995. The coal mining industry will experience the greatest absolute and proportional employment effect of any BLS sector: 68,000 coal mining jobs will be supported by the industry in 1995, over 20 percent of all coal mining employment projected for 1995 by the BLS.

Given the existence of large high-sulfur coal reserves, large transportation fuel demand, and technical support industries, it is likely that much of the employment generated by a methanol fuel industry would be concentrated in the Midwest. If all of these jobs were located in the Midwest, total methanol-related employment would equal almost 1.5 percent of estimated total employment in 1995 for the states of Pennsylvania, Ohio, West Virginia, Michigan, Illinois, Indiana, and Kentucky. The industry's share of total employment in these states would range from 0.46 percent in 1985 to 2.74 percent in 1989.

Employment associated with the construction of the plants compares favorably with that supported by the construction of public works projects such as dams, sewer lines, public housing, and powerplants. The expenditure of $1 billion (1981 dollars) on the construction of a methanol plant will provide 18,300 direct and indirect construction jobs, while a similar expenditure on a typical public works project will create 17,800 construction jobs. The distribution of the jobs between direct and indirect employment, however, differs significantly. Over 65 percent of the jobs supported by an average public works project are direct jobs, while only 30 percent of methanol plant construction employment is direct employment. This reflects the value and labor content of the primary and intermediate products that are inputs into the construction of a methanol plant.

The total amount of employment (direct, indirect, and induced with respect to construction and operation) supported by a domestic fuel-methanol industry will equal 13,218,460 job-years between 1985 and 2020, given an expenditure of $445.4 billion on

EXHIBIT E-2:

PROJECTED ANNUAL METHANOL-RELATED JOBS: SHARE OF CIVILIAN LABOR FORCE

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Projected Civilian Labor Force (000)[1]	116,978	118,693	120,421	122,002	123,563	124,951	126,350	127,587	128,860	130,102	131,387
Projected Methanol-Related Jobs (000)	108	248	359	506	667	636	577	541	468	383	379
Methanol-Related Jobs: Share of Labor Force (%)	0.09	0.21	0.30	0.41	0.54	0.51	0.46	0.42	0.36	0.29	0.29

[1] U.S. Department of Labor, Bureau of Labor Statistics, Monthly Labor Review, November 1983 for 1990 and 1995. Unpublished data from BLS for remaining years.

the construction and operation of the 30 plants. Thus, 29,676 job-years of employment are supported by every $1 billion expended in a domestic methanol industry. Compared to estimates of total job creation over the same period for an identical level of expenditure in several other sectors, a methanol industry would likely support more jobs than defense purchases, an equal number of jobs compared to other industrial projects, and fewer jobs compared to low wage, low overhead, public service employment programs.

In addition to generating increased domestic employment, the development of a domestic methanol production industry will result in the reduction of oil imports by the United States, especially if the fuel is used for transportation purposes. For example, 30 plants producing a total of 2.5 million barrels per day of methanol would displace approximately 1.5 million barrels per day of gasoline refined from imported oil in 1995. This will result in a significant and sustained reduction in oil import payments. A comparison of the present discounted value of the capital investment costs for 30 methanol plants with the present discounted value of the displaced gasoline refined from imported oil (see Exhibit E-3) over the period from 1985 to 1995 shows that methanol investment costs of $58.45 billion (1981 dollars) exceed oil import reductions of $36.65 billion.[1] Lower oil import payments will continue well past 1995, however. By the year 2000, just 6 years after the last set of plants begins operation, the present discounted value of the reduced oil import payments ($65.75 billion) exceeds the present discounted value of the methanol plants capital investment. By 2020, the present discounted value of the oil import reductions totals $106.34 billion, nearly $50 billion more than the present discounted value of the capital investment.

This discussion is not meant to imply that the total cost of methanol fuel would necessarily be less than that of gasoline to the vehicle consumer. A comparison of total fuel costs would have to include additional costs associated with methanol production such as coal and labor costs, and would have to project these costs and world oil prices well into the future. Such a comparison is beyond the scope of this study. One concern with development of a coal-to-methanol industry is the large initial capital investment. The point of Exhibit E-3 is to show that although the capital investment required for the construction of 30 methanol plants is high, the plants could ultimately improve the domestic capital pool by reducing the export of larger quantities of U.S. dollars for imported oil. If the capital which would be spent on imported oil were instead spent on

[1] Assumes a discount rate of 10 percent and a price of $40 per barrel of gasoline.

EXHIBIT E-3:

DISCOUNTED TOTAL CONSTRUCTION EXPENDITURES AND DISCOUNTED OIL IMPORT PAYMENT REDUCTIONS FOR KEY TIME PERIODS (Billions of 1981 Dollars)[1]

Period	Discounted Construction Expenditures	Discounted Value of Displaced Oil Imports
Through:		
1995	58.45	36.65
2000	58.45	65.75
2005	58.45	83.82
2010	58.45	95.04
2015	58.45	102.01
2020	58.45	106.34

[1]Expressed in 1981 dollars discounted to 1984 from forecast year.

domestic goods and services (such as coal and labor for methanol production) then greater domestic investment and employment would result and our balance of payments would be improved.

D. LIMITATIONS OF THIS ANALYSIS

The interpretation of the results of this analysis are limited by the following factors:

- The use of an interindustry model to estimate indirect and induced employment produces results based on average relationships among economic sectors. These average relationships may differ significantly from marginal relationships that would more accurately reflect the effects of increasing demand for particular goods and services.

- Demand for materials and services is assumed to be satisfied by U.S. production; imports are not considered. This assumption leads to an overstatement of U.S. employment that varies directly for each sector with the importance of imports in that sector.

- All materials inputs are assumed to be produced, purchased, and consumed in the same year. There is no distribution of the purchase of a given year's consumption over time.

- It is assumed that no investment capital expended on developing the methanol industry is diverted away from other productive enterprises. Furthermore, the possibility of job loss in some sectors of the economy is not considered. Thus, the results of the analysis can only be interpreted as representing the employment supported by the industry, and not as the marginal impact of the industry on total employment in the economy. Furthermore, the analysis stops at the production of the methanol, and does not consider employment associated with its distribution and use.

CHAPTER I:
INTRODUCTION

The purpose of this study was to estimate the employment supported by the construction and operation of coal-to-methanol plants on a large scale. Three types of employment impacts were considered: direct, indirect, and induced. Direct employment impacts are those immediately associated with the construction and operation of the plants. Indirect employment impacts are those associated with the purchase of goods and services from various sectors of the economy in support of plant construction and operation. Finally, induced employment impacts occur as changes in output and employment lead to changes in personal income and increased consumption. Direct, indirect, and induced employment impacts occur during both the construction and operation stages in the development of a methanol fuel industry.

The coal-to-methanol scenario adopted reflects the following requirements:

1. 500,000 barrels per day (BPD) of methanol production capacity will be added each year from 1990 through 1994.

2. The methanol feedstock will be high-sulfur coal from the east and the midwest.

3. No investment capital expended on the methanol plants is diverted away from other productive enterprises.

4. Employment impacts associated with the distribution and use of methanol are not considered.

Other constraints on the analysis which must be considered when interpreting the results include the following:

1. All demand for materials and services was assumed to be satisfied by U.S. production; imports are not considered. Consequently, U.S. employment impacts are overestimated. The degree of overestimation in a sector varies directly in size with the importance of imports in that sector. The

relationships between imports and total consumption for each sector are listed in Chapter III, Exhibit III-3.

2. The estimates of direct employment associated with plant construction and operation are full-time equivalent employees. The estimates of indirect and induced employment are estimates of "number of jobs."

3. Use of an input-output model as the tool for estimating indirect and induced employment, as in the current analysis, produces results based on average relationships among sectors within the economy. Average relationships may differ significantly from marginal relationships that would more accurately reflect the effects of increasing demand for particular goods and services.

4. It is assumed that all material inputs to methanol plant construction and operation are produced and consumed in the same year.

The remainder of this report consists of a project overview (Chapter II) which describes the methanol production scenario, the analysis methodology, and data development; an assessment of employment (Chapter III) which details the direct, indirect, and induced employment effects of plant construction and operation, and an analysis of the significance of the employment estimates (Chapter IV). An appendix documenting the data development is also provided.

CHAPTER II
PROJECT OVERVIEW

This chapter provides an overview of the key analytical components of this study. Additional detail on many of these components is presented in the appendices.

A. LITERATURE REVIEW

A detailed review of technical literature on synthetic fuels production was undertaken as the first step in the analysis. The purpose of this review was to identify cost and employment data for synthetic fuels plant construction and operation data. Literature reviewed included proposals submitted to the U.S. Synthetic Fuels Corporation and plant feasibility studies performed for the U.S. Department of Energy. A list of plant studies considered is provided in Appendix A-1.

B. SELECTION OF PROTOTYPE PLANT DESIGN

The plant design selected was a coal-to-methanol plant feasibility study performed by Dames and Moore and the Nokota Company under contract to the Department of Energy. This well documented study offers a high degree of detail on plant construction and operating employment, and on materials and services requirements.[1] In addition, the Fluor Corporation, which performed the preliminary plant design study and cost estimation for the D.O.E. project, provided detail beyond that published for use in the current analysis.

The Dames and Moore synfuel plant uses a Lurgi Fixed-Bed Gasifier and Methanol Synthesis process to produce 85,000 barrels per day (BPD) of methanol from 28,000 tons per day of lignite. Adjustments were made to the plant design data to reflect the use of bituminous coal instead of lignite. Adjustments were also made to compress the feasibility study's construction schedule from seven years to six years. These adjustments are described in the following sections on the development of coal-to-methanol plant construction and operation scenarios.

[1] Dames and Moore/The Nokota Company, Dunn-Nokota Methanol Project. Prepared for U.S. Department of Energy, Volumes I-VIII, 1983.

C. OVERVIEW OF PLANT CONSTRUCTION AND OPERATION SCENARIOS

The plant construction and operation scenarios assume a total of 30 plants are constructed over the 1985 to 1994 period, with construction of six plants beginning in each year from 1985 to 1989. Construction is completed in six years. The last year of construction is also a year of full operation. One-time start-up costs are incurred a year prior to operation. For example, a plant whose construction began in 1985 would be completed in 1990. Start-up costs would be incurred in 1989 and full operation would begin in 1990.

This scenario differs from that described by the Dames and Moore study in that construction takes place in six years instead of seven, in order to begin full production in 1990. Reduction of the construction schedule by one year involved spreading the small first year effort anticipated by Dames and Moore over the three subsequent years of construction. The methodology used is documented in Appendix A-2.

D. CONSTRUCTION, START-UP, AND OPERATING INPUTS (EXCLUDING COAL)

In order to estimate the indirect employment associated with the construction and operation of 30 methanol plants, it is necessary to know the value of inputs into construction and operation. The basis for data on expenditures on goods and services for plant construction, start-up, and operation was the Dames and Moore coal-to-methanol feasibility study. The aggregate data provided in the Dames and Moore report were disaggregated to the Bureau of Labor Statistics (BLS) sector level using a combination of:

1) data made available by the Fluor Corporation, which performed the plant design study and cost estimation for Dames and Moore, and

2) additional data available through economic and business publications, and developed through discussions with trade association personnel.

The BLS sectoring plan is included as Appendix A-3. The use of the BLS sectoring plan was necessary since the BLS Economic Growth Model System was used to estimate indirect employment supported by the methanol industry.

Once the cost data in the Dames and Moore study were disaggregated to the BLS sector level (see Appendix A-4), the costs were adjusted to the specifications of the BLS input-output model used in this analysis to estimate indirect employment. Cost data, which had been developed in purchasers' prices, were converted to producers' prices by subtracting wholesale trade margins and transportation costs from the purchasers' prices. The producers' prices were then deflated from the 1981 constant dollars used in the Dames and Moore study and throughout subsequent data development to 1972 constant dollars. The methodologies for the transitions from purchasers' to producers' prices, and from 1981 to 1972 dollars, are described in Appendices A-5 and A-6, respectively.

The final step was the development of a yearly schedule of expenditures for each plant, and for the 30 plant scenario. Construction expenditures for goods and services were assumed to occur over the six year plant construction period in approximately the same proportions as employment in each year of construction, as shown:

Schedule of Expenditures on Construction Goods and Services[1]

Year	Percentage of Total Construction Expenditures on Goods and Services
1	21%
2	25%
3	17%
4	22%
5	15%
6	0%
	100%

Full operations, and thus full operating costs, begin in the sixth year of construction and continue through 1995. One-time start-up costs are incurred in the fifth year of construction. This single plant construction and operation expenditure schedule was then combined with the 30 plant construction and operation schedule to develop the 30 plant scenario for expenditures on goods and services (Exhibit II-1). The resulting bill of goods (annual expenditures in 1972 dollars by BLS sector and in total) is provided in Exhibit II-2 for construction and Exhibit II-3 for start-up and operation.

[1]The development of this schedule is detailed in Appendix A-2.

EXHIBIT II-1:

30 PLANT CONSTRUCTION, START-UP, AND OPERATION SCHEDULE

YEAR / PLANTS	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Plants 1-6	C	C	C	C	C S	C* O	O	O	O	O	O
Plants 7-12		C	C	C	C	C S	C* O	O	O	O	O
Plants 13-18			C	C	C	C	C S	C* O	O	O	O
Plants 19-24				C	C	C	C	C S	C* O	O	O
Plants 25-30					C	C	C	C	C S	C* O	O

Key: C = Construction
S = Start-Up
O = Operation

*Note: There are no inputs of goods and services associated with the last year of plant construction.

EXHIBIT II-2:

CONSTRUCTION BILL OF GOODS, BY BLS SECTOR — 1985-1993

(thousands of 1972 dollars, producers' prices)

BLS SECTOR	1985	1986	1987	1988	1989	1990	1991	1992	1993
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	18588.8	48718.5	55766.5	75240.5	88518.0	69929.2	47799.7	32751.7	13277.7
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37	49.1	107.6	147.4	198.9	234.0	184.9	126.4	86.6	35.1
38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
42	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
43	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
44	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
46	10873.8	23818.8	32621.4	44013.0	51780.0	40906.2	27961.2	19158.6	7767.0
47	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
48	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
49	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

EXHIBIT II-2:

CONSTRUCTION BILL OF GOODS, BY BLS SECTOR — (Continued)

BLS SECTOR	1985	1986	1987	1988	1989	1990	1991	1992	1993
50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
51	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
53	2887.3	6149.3	8421.8	11362.8	13368.0	10560.7	7218.7	4946.2	2885.2
54	23.9	52.4	71.8	96.9	114.0	90.1	61.6	42.2	17.1
55	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
56	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
57	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
58	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
59	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
61	31980.1	70051.6	95940.2	129443.1	152286.0	120305.9	82234.4	56345.8	22842.9
62	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
63	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
64	7688.3	16648.3	22801.8	30763.2	36192.0	28591.7	19543.7	13391.8	5428.8
65	18925.2	41455.2	56775.6	76682.8	90120.0	71194.8	48666.8	33346.4	13518.0
66	6826.7	14953.7	20480.0	27631.8	32508.0	25681.3	17554.3	12028.0	4876.2
67	31.5	69.0	94.5	127.5	150.0	118.5	81.0	55.5	22.5
68	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
69	13338.8	29208.8	39992.4	53958.0	63480.0	50149.2	34279.2	23487.6	9522.0
70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
72	16459.4	36053.9	49378.1	66621.3	78378.0	61918.6	42324.1	28999.9	11756.7
73	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
74	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
75	4876.2	10681.2	14628.6	19737.0	23220.0	18343.8	12538.8	8591.4	3483.0
76	81748.0	179069.5	245219.9	330852.3	389238.0	307498.0	210188.5	144018.1	58385.7
77	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
78	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
79	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80	609.8	1335.8	1829.5	2468.4	2904.0	2294.2	1568.2	1074.5	435.6
81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
82	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
83	311136.8	681937.8	933410.5	1259363.4	1481604.0	1170467.2	800866.2	548193.5	222240.6
84	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
85	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
86	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
87	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
88	11309.8	24773.8	33929.3	45777.6	53856.0	42546.2	29082.2	19926.7	8078.4
89	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
90	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
91	28442.8	62301.5	85325.9	115122.3	135438.0	106996.8	73136.5	50112.1	20315.7
92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
93	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
94	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
95	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
96	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
97	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
98	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

EXHIBIT II-2:

CONSTRUCTION BILL OF GOODS, BY BLS SECTOR — (Continued)

BLS SECTOR	1985	1986	1987	1988	1989	1990	1991	1992	1993
99	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
101	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
102	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
103	39647.2	86846.2	118941.5	160476.6	188796.0	149148.8	101949.8	69854.5	28319.4
104	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
106	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
107	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
108	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
109	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
111	4983.3	10915.8	14949.9	20170.5	23730.0	18746.7	12814.2	8780.1	3559.5
112	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
113	17849.2	39098.2	53547.5	72246.6	84996.0	67146.8	45897.8	31448.5	12749.4
114	1247.4	2732.4	3742.2	5049.0	5940.0	4692.6	3207.6	2197.8	891.0
115	255.8	560.3	767.3	1035.3	1218.0	962.2	657.7	450.7	182.7
116	6.3	13.8	18.9	25.5	30.0	23.7	16.2	11.1	4.5
117	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
118	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
119	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
120	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
121	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
122	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
123	61183.7	133846.2	183311.1	247324.5	290970.0	229866.3	157123.8	107658.9	43645.5
124	1224.7	2682.7	3674.2	4957.2	5832.0	4607.3	3149.3	2157.8	874.8
125	1941.7	4253.2	5825.8	7859.1	9246.0	7304.3	4992.8	3421.0	1386.9
126	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
127	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
128	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
129	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
130	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
131	4039.6	8848.6	12118.7	16350.6	19236.0	15196.4	10387.4	7117.3	2885.4
132	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
133	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
134	110239.9	241477.9	330719.8	446209.2	524952.0	414712.1	283474.1	194232.2	78742.8
135	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
136	1813.1	3971.6	5439.4	7338.9	8634.0	6820.9	4662.4	3194.6	1295.1
137	2389.0	5233.8	7166.9	9669.6	11376.0	8987.0	6143.0	4209.1	1706.4
138	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
139	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
140	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
141	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
142	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
143	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
144	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
145	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
146	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
147	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

EXHIBIT II-2:

CONSTRUCTION BILL OF GOODS, BY BLS SECTOR — (Continued)

BLS SECTOR	1985	1986	1987	1988	1989	1990	1991	1992	1993
148	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
149	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
150	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
151	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
152	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
153	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
154	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
155	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
156	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SUMS	812352.2	1779438.2	2437056.7	3288092.4	3868344.0	3855991.8	2888985.8	1431287.3	589251.6

EXHIBIT II-3:

BILL OF GOODS FOR START-UP AND OPERATION, BY BLS SECTOR

1989 - 1995

(thousands of 1972 dollars, producers' prices)

BLS SECTOR	1989	1990	1991	1992	1993	1994	1995
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	1116.0	1824.0	2532.0	3240.0	3948.0	3540.0	3540.0
11	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	9252.0	23574.0	37896.0	52218.0	66540.0	71610.0	71610.0
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40	13140.0	13608.0	14076.0	14544.0	15012.0	2340.0	2340.0
41	0.0	0.0	0.0	0.0	0.0	0.0	0.0
42	0.0	0.0	0.0	0.0	0.0	0.0	0.0
43	0.0	0.0	0.0	0.0	0.0	0.0	0.0
44	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45	0.0	0.0	0.0	0.0	0.0	0.0	0.0
46	42486.0	62916.0	83346.0	103776.0	124206.0	102150.0	102150.0
47	366.0	834.0	1302.0	1770.0	2238.0	2340.0	2340.0
48	498.0	1326.0	2154.0	2982.0	3810.0	4140.0	4140.0
49	510.0	1350.0	2190.0	3030.0	3870.0	4200.0	4200.0

EXHIBIT II-3:

BILL OF GOODS FOR START-UP AND OPERATION, BY BLS SECTOR — (Continued)

BLS SECTOR	1989	1990	1991	1992	1993	1994	1995
50	0.0	0.0	0.0	0.0	0.0	0.0	0.0
51	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	0.0	0.0	0.0	0.0	0.0	0.0	0.0
53	804.0	1242.0	1680.0	2118.0	2556.0	2190.0	2190.0
54	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55	0.0	0.0	0.0	0.0	0.0	0.0	0.0
56	0.0	0.0	0.0	0.0	0.0	0.0	0.0
57	0.0	0.0	0.0	0.0	0.0	0.0	0.0
58	0.0	0.0	0.0	0.0	0.0	0.0	0.0
59	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60	0.0	0.0	0.0	0.0	0.0	0.0	0.0
61	15006.0	27564.0	40122.0	52680.0	65238.0	62790.0	62790.0
62	0.0	0.0	0.0	0.0	0.0	0.0	0.0
63	0.0	0.0	0.0	0.0	0.0	0.0	0.0
64	2430.0	3768.0	5106.0	6444.0	7782.0	6690.0	6690.0
65	6276.0	9726.0	13176.0	16626.0	20076.0	17250.0	17250.0
66	2256.0	3492.0	4728.0	5964.0	7200.0	6180.0	6180.0
67	0.0	0.0	0.0	0.0	0.0	0.0	0.0
68	0.0	0.0	0.0	0.0	0.0	0.0	0.0
69	4548.0	7050.0	9552.0	12054.0	14556.0	12510.0	12510.0
70	0.0	0.0	0.0	0.0	0.0	0.0	0.0
71	0.0	0.0	0.0	0.0	0.0	0.0	0.0
72	8940.0	13848.0	18756.0	23664.0	28572.0	24540.0	24540.0
73	0.0	0.0	0.0	0.0	0.0	0.0	0.0
74	0.0	0.0	0.0	0.0	0.0	0.0	0.0
75	1656.0	2568.0	3480.0	4392.0	5304.0	4560.0	4560.0
76	27528.0	42654.0	57780.0	72906.0	88032.0	75630.0	75630.0
77	0.0	0.0	0.0	0.0	0.0	0.0	0.0
78	0.0	0.0	0.0	0.0	0.0	0.0	0.0
79	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80	55584.0	57672.0	59760.0	61848.0	63936.0	10440.0	10440.0
81	0.0	0.0	0.0	0.0	0.0	0.0	0.0
82	0.0	0.0	0.0	0.0	0.0	0.0	0.0
83	104922.0	162558.0	220194.0	277830.0	335466.0	288180.0	288180.0
84	0.0	0.0	0.0	0.0	0.0	0.0	0.0
85	0.0	0.0	0.0	0.0	0.0	0.0	0.0
86	0.0	0.0	0.0	0.0	0.0	0.0	0.0
87	0.0	0.0	0.0	0.0	0.0	0.0	0.0
88	3798.0	5886.0	7974.0	10062.0	12150.0	10440.0	10440.0
89	0.0	0.0	0.0	0.0	0.0	0.0	0.0
90	0.0	0.0	0.0	0.0	0.0	0.0	0.0
91	9636.0	14928.0	20220.0	25512.0	30804.0	26460.0	26460.0
92	0.0	0.0	0.0	0.0	0.0	0.0	0.0
93	0.0	0.0	0.0	0.0	0.0	0.0	0.0
94	0.0	0.0	0.0	0.0	0.0	0.0	0.0
95	0.0	0.0	0.0	0.0	0.0	0.0	0.0
96	0.0	0.0	0.0	0.0	0.0	0.0	0.0
97	0.0	0.0	0.0	0.0	0.0	0.0	0.0
98	0.0	0.0	0.0	0.0	0.0	0.0	0.0

EXHIBIT II-3:

BILL OF GOODS FOR START-UP AND OPERATION, BY BLS SECTOR — (Continued)

BLS SECTOR	1989	1990	1991	1992	1993	1994	1995
99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0
101	0.0	0.0	0.0	0.0	0.0	0.0	0.0
102	0.0	0.0	0.0	0.0	0.0	0.0	0.0
103	21162.0	28764.0	36366.0	43968.0	51570.0	38010.0	38010.0
104	0.0	0.0	0.0	0.0	0.0	0.0	0.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0
106	0.0	0.0	0.0	0.0	0.0	0.0	0.0
107	0.0	0.0	0.0	0.0	0.0	0.0	0.0
108	0.0	0.0	0.0	0.0	0.0	0.0	0.0
109	0.0	0.0	0.0	0.0	0.0	0.0	0.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0
111	5268.0	8970.0	12672.0	16374.0	20076.0	18510.0	18510.0
112	0.0	0.0	0.0	0.0	0.0	0.0	0.0
113	10854.0	19704.0	28554.0	37404.0	46254.0	44250.0	44250.0
114	1032.0	1998.0	2964.0	3930.0	4896.0	4830.0	4830.0
115	114.0	162.0	210.0	258.0	306.0	240.0	240.0
116	24.0	36.0	48.0	60.0	72.0	60.0	60.0
117	0.0	0.0	0.0	0.0	0.0	0.0	0.0
118	0.0	0.0	0.0	0.0	0.0	0.0	0.0
119	0.0	0.0	0.0	0.0	0.0	0.0	0.0
120	6744.0	18210.0	29676.0	41142.0	52608.0	57330.0	57330.0
121	0.0	0.0	0.0	0.0	0.0	0.0	0.0
122	708.0	3540.0	6372.0	9204.0	12036.0	14160.0	14160.0
123	35568.0	50448.0	65328.0	80208.0	95088.0	74400.0	74400.0
124	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125	0.0	0.0	0.0	0.0	0.0	0.0	0.0
126	0.0	0.0	0.0	0.0	0.0	0.0	0.0
127	0.0	0.0	0.0	0.0	0.0	0.0	0.0
128	0.0	0.0	0.0	0.0	0.0	0.0	0.0
129	0.0	0.0	0.0	0.0	0.0	0.0	0.0
130	0.0	0.0	0.0	0.0	0.0	0.0	0.0
131	0.0	0.0	0.0	0.0	0.0	0.0	0.0
132	0.0	0.0	0.0	0.0	0.0	0.0	0.0
133	0.0	0.0	0.0	0.0	0.0	0.0	0.0
134	0.0	0.0	0.0	0.0	0.0	0.0	0.0
135	0.0	0.0	0.0	0.0	0.0	0.0	0.0
136	0.0	0.0	0.0	0.0	0.0	0.0	0.0
137	0.0	0.0	0.0	0.0	0.0	0.0	0.0
138	0.0	0.0	0.0	0.0	0.0	0.0	0.0
139	0.0	0.0	0.0	0.0	0.0	0.0	0.0
140	0.0	0.0	0.0	0.0	0.0	0.0	0.0
141	0.0	0.0	0.0	0.0	0.0	0.0	0.0
142	0.0	0.0	0.0	0.0	0.0	0.0	0.0
143	0.0	0.0	0.0	0.0	0.0	0.0	0.0
144	0.0	0.0	0.0	0.0	0.0	0.0	0.0
145	0.0	0.0	0.0	0.0	0.0	0.0	0.0
146	0.0	0.0	0.0	0.0	0.0	0.0	0.0
147	0.0	0.0	0.0	0.0	0.0	0.0	0.0

EXHIBIT II-3:

BILL OF GOODS FOR START-UP AND OPERATION, BY BLS SECTOR — (Continued)

BLS SECTOR	1989	1990	1991	1992	1993	1994	1995
148	0.0	0.0	0.0	0.0	0.0	0.0	0.0
149	0.0	0.0	0.0	0.0	0.0	0.0	0.0
150	0.0	0.0	0.0	0.0	0.0	0.0	0.0
151	0.0	0.0	0.0	0.0	0.0	0.0	0.0
152	0.0	0.0	0.0	0.0	0.0	0.0	0.0
153	0.0	0.0	0.0	0.0	0.0	0.0	0.0
154	0.0	0.0	0.0	0.0	0.0	0.0	0.0
155	0.0	0.0	0.0	0.0	0.0	0.0	0.0
156	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SUMS	392226.0	590220.0	788214.0	986208.0	1184202.0	989970.0	989970.0

E. COAL INPUTS

In order to estimate the employment associated with the mining of coal for the 30 methanol plants, it is necessary to estimate the amount of coal required to produce the methanol output. Coal-to-methanol feasibility and design studies assume coal inputs of from 20,000 tons to 30,000 tons per day to produce 85,000 barrels per day of methanol, depending on the energy content of the coal. The Lurgi Fixed-Bed Gasifier and Methanol Synthesis process proposed by Dames and Moore uses 28,000 tons of lignite per day (not including coal used to produce electricity at the plant). Plant studies by Jack Faucett Associates and Battelle Columbus Laboratories for NASA using the Texaco-ICI process indicated that 20,000 tons of bituminous coal would be required per day to produce 85,000 barrels of methanol (again not including coal for electricity).[1]

An average consumption of 25,000 tons of coal per day was assumed for the current study. This figure includes the high-sulfur bituminous coal consumed in methanol synthesis as well as the coal used to generate electricity for the plant. Although plant operation does not begin until 1990, demand for coal begins in 1986, the second year of construction. This coal is assumed to be stockpiled for future use, with demand growing over the construction period at the rates shown below:

Demand for Coal

Year	Percentage of Full Operating Demand
1	0%
2	20%
3	40%
4	60%
5	80%
Remaining Years To 1995	100%

Schedules of coal demand, in tons and in dollar value, are provided in Exhibits II-4 and II-5, respectively. Coal data development is documented in Appendix A-7, as is the development of the bill of goods necessary to estimate coal related employment using the BLS Economic Growth Model System.

[1] Weinblatt, Herbert and Michael F. Lawrence, Jack Faucett Associates; and David Jenkins, Battelle Columbus Laboratories. Energy and Precious Fuels Requirements of Fuel Alcohol Production. Prepared for the National Aeronautics and Space Administration, December 1982.

EXHIBIT II-4:

TONS OF COAL CONSUMED PER YEAR

1986-1995

(Millions of Tons)

YEAR / PLANTS	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Plants 1-6	10.95	21.90	32.85	43.80	54.75	54.75	54.75	54.75	54.75	54.75
Plants 7-12		10.95	21.90	32.85	43.80	54.75	54.75	54.75	54.75	54.75
Plants 13-18			10.95	21.90	32.85	43.80	54.75	54.75	54.75	54.75
Plants 19-24				10.95	21.90	32.85	43.80	54.75	54.75	54.75
Plants 25-30					10.95	21.90	32.85	43.80	54.75	54.75
Total	10.95	32.85	65.70	109.50	164.25	208.05	240.90	262.80	273.75	273.75

EXHIBIT II-5:

VALUE OF COAL CONSUMED PER YEAR

1986 - 1995

(Producer's Prices)

Year	Value (thousands of 1972 dollars)
1986	$ 83,877
1987	$ 251,669
1988	$ 503,262
1989	$ 838,770
1990	$1,258,155
1991	$1,593,633
1992	$1,845,294
1993	$2,013,048
1994	$2,096,925
1995	$2,096,925

F. ESTIMATION OF DIRECT EMPLOYMENT: METHODOLOGY

Estimates of direct, per plant annual construction and operation employment were derived from similar data presented in the Dames and Moore feasibility study. Exhibit II-6 presents the annual construction and operation employment schedules anticipated by Dames and Moore; and the annual construction and operation employment schedules derived from them for this analysis.

As shown in Exhibit II-6, the projected operation employment schedules are identical, except that it is assumed that some operation employment begins during the second year of construction rather than in the third.[1] This is because the construction schedule was compressed to six years from seven years for purposes of this analysis. The compression of the construction schedule also explains the differences between the Dames and Moore construction employment schedule and the schedule used in this study. Since the construction schedule was compressed from seven years to six years, the small first year effort anticipated by Dames and Moore was spread over the three subsequent years of construction. Thus, the projected construction employment schedule approximates that assumed by Dames and Moore for years 2 through 7, with the exception that additional employment is anticipated in the first three years to offset the effort lost by eliminating the 557 jobs originally projected for year 1.

Given these per plant estimates and a construction and operation schedule, total direct construction employment and total direct operation employment may be determined for each year in the period from 1985 through 1995.

G. ESTIMATION OF INDIRECT EMPLOYMENT: METHODOLOGY

The bills of goods developed above are the foundation for estimating indirect employment using a standard Leontief interindustry economic model and a labor demand model. The industry activity model, in combination with the estimates of the primary inputs for construction, start-up, and operation, is used to estimate changes in an industry's output due to changes in demand for its product resulting from the construction or the operation of a methanol plant. When coupled with a labor demand model, these changes in demand are translated into estimates of employment associated with that demand.

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[1] Some operation employment will occur prior to full operation since employees must be trained and equipment tested.

EXHIBIT II-6:

CONSTRUCTION AND OPERATION WORK FORCE REQUIREMENTS

YEAR	CONSTRUCTION		OPERATION	
	Dames and Moore	This Analysis	Dames and Moore	This Analysis
1	557	3,500	0	
2	3,186	4,200	0	450
3	4,012	2,800	424	1,150
4	2,692	3,700	1,145	1,150
5	3,643	2,600	1,145	1,400
6	2,629	150	1,400	1,600
7	137	0	1,616	1,600
8 and beyond	0	0	1,616	1,600

Source of Dames and Moore Data: Dunn-Nokota Methanol Project, Dunn County, North Dakota, Vol. VII, p. 5-75. 1983.

The models selected to estimate indirect employment were the interindustry model and the Bureau of Labor Statistics labor demand model contained in the Bureau of Labor Statistics' Economic Growth Model System. Given estimates of revenue impacts by supplier industry and a plant construction and operating schedule, these models estimate indirect employment in the industries that supply the methanol industry directly, and in the industries that provide goods and services to those primary supplier industries.[1]

H. ESTIMATION OF INDUCED EMPLOYMENT: METHODOLOGY

Induced employment stems from the expenditure of disposable personal income on the consumption of goods and services by income-earning individuals and their families. These personal consumption expenditures (PCE) may originate from the direct and the indirect employment supported by an industry, or from existing induced employment supported by previous changes in PCE. Thus, total induced employment resulting from a given initial change in PCE may be divided into several consecutive rounds of induced employment, each round dependent on the level of PCE created by the previous round's employment.

Assuming that PCE per job in a given year is constant, and that total PCE is distributed in constant proportions over all consumer goods during each round, the following equation is used to calculate the level of induced employment resulting from an initial change in PCE associated with changes in direct and indirect employment:

$$(1) \quad \text{Total Induced Employment} = \left[\frac{1}{1-R} \times N \right] - N$$

where

R = the ratio of the initial round of induced employment to the sum of direct and indirect employment; and

N = the sum of direct and indirect employment.

[1] Complete documentation of the models used may be found in BLS Economic Growth Model System Used for Projections to 1990. U.S. Department of Labor, Bureau of Labor Statistics, April 1982. Bulletin 2112.

The first term in the brackets in equation (1) is called the total employment multiplier, since multiplying it by the sum of direct and indirect employment yields the total of direct, indirect, and induced employment.

The initial round of induced employment in this study is generated by the personal consumption expenditures of those individuals directly and indirectly employed by the domestic methanol production industry. Given this basis, annual total induced employment was calculated in five steps. First, the effect of the estimated annual levels of direct and indirect employment on disposable income and on personal consumption expenditures (PCE) was forecasted. Second, the change in PCE was distributed across the projected PCE vector embodied in the BLS interindustry model according to the proportions forecasted by the model. Third, the BLS interindustry model and the BLS labor demand model were used to estimate the initial round of induced employment resulting from the change in PCE. Fourth, the ratio of initial induced employment to the sum of direct and indirect employment was used to estimate a total employment multiplier. Fifth, the sum of direct and indirect employment was multiplied by this multiplier to yield total employment. Induced employment was then calculated by subtracting direct employment and indirect employment from this total employment estimate.

In order to project the change in PCE resulting from the estimated levels of direct and indirect employment, it was necessary to estimate expected PCE per job, in 1972 dollars, for each year from 1985 through 1995. The following method was used to accomplish this:

- Average annual earnings of $9,038 for October 1983 (in 1977 dollars) were assumed to grow at a real rate of 2.5 percent through 1995, yielding projections of average annual earnings for each year from 1985 through 1995.[1]

- These projections, in 1977 dollars, were deflated to 1972 dollars.[2]

[1] Employment and Earnings. U.S. Department of Labor, Bureau of Labor Statistics, December 1983. Table C-4.

[2] Ibid., Table C-1.

- A historic average ratio of PCE to personal income was calculated and applied to the average annual earnings estimate to calculate average PCE per job (ratio = .77).[1]

These projections are shown in Exhibit II-7.

[1] Survey of Current Business. U.S. Department of Commerce, Bureau of Economic Analysis, July and October, 1983. Table 2-1.

EXHIBIT II-7:
AVERAGE ANNUAL PCE PER JOB IN 1972 DOLLARS

YEAR	Average Annual Earnings	PCE
1985	$6,878	$5,296
1986	$7,050	$5,429
1987	$7,226	$5,564
1988	$7,407	$5,703
1989	$7,592	$5,846
1990	$7,782	$5,992
1991	$7,976	$6,142
1992	$8,176	$6,296
1993	$8,380	$6,453
1994	$8,590	$6,614
1995	$8,805	$6,780

CHAPTER III:
DIRECT, INDIRECT, AND INDUCED EMPLOYMENT IMPACTS

Development of a coal-to-methanol industry will affect employment in three ways:

1) directly, through plant construction and operation;

2) indirectly, through increased demand for goods and services to be used in plant construction and operation; and

3) through increased personal income expenditures caused by the initial expansion in employment (induced employment).

The employment supported by the construction and operation of 30 coal-to-methanol plants is summarized in Exhibit III-1. The first year of plant construction will create an estimated 108,000 jobs. As the construction of additional plants begins, and as coal begins to be stockpiled, employment climbs steadily to a peak of 667,000 in 1989. After 1989, employment decreases as construction activities decline. In 1995, all plants are fully operational and employment reaches a steady-state impact of 378,000 jobs. Further detail on direct and indirect employment is provided by Exhibit III-2, which lists employment by BLS sector and by year (excluding induced employment).

When interpreting the projected employment data, it is important to note that one assumption of the analysis was that all demand for plant construction and operation goods and services would be satisfied by domestic producers. To the extent that demand is satisfied by imports, domestic employment will be smaller. Forecasts of the amount of total U.S. consumption that is expected to be represented by imports in 1995, by BLS sector, are presented in Exhibit III-3. The forecasts were made by the BLS Economic Growth Model System for the total U.S. economy. While the relationships between imports and U.S. consumption reported do not necessarily apply to the goods and services demanded directly and indirectly by the coal-to-methanol plants, the data are a useful aid to the interpretation of the employment data presented in this chapter.

Details on the direct and indirect employment supported by plant construction, on the direct and indirect employment supported by plant operation (excluding those related to

EXHIBIT III-1:

EMPLOYMENT IMPACTS SUMMARY

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Construction Employment	71,960	155,790	210,412	280,961	328,372	257,400	173,971	118,939	48,635	900	0
Direct	21,000	46,200	63,000	85,200	100,800	80,700	55,500	38,700	16,500	900	0
Indirect	50,960	109,590	147,412	195,761	227,572	176,700	118,471	80,239	32,135	0	0
Operation Employment	0	2,700	9,600	16,500	47,082	66,800	83,552	96,081	108,221	97,639	96,593
Direct	0	2,700	9,600	16,500	24,900	34,500	41,400	44,100	46,800	48,000	48,000
Indirect	0	0	0	0	22,182	32,300	42,152	51,981	61,421	49,639	48,593
Coal Employment	0	5,709	16,902	33,603	56,308	84,206	109,230	125,073	134,639	138,111	135,381
Coal Mining	0	2,671	7,946	15,973	27,268	41,359	55,919	63,912	68,499	69,886	67,688
Other Mine Mouth	0	287	838	1,637	2,663	3,875	4,860	5,551	5,930	6,012	5,802
Other Indirect	0	2,751	8,118	15,993	26,377	38,972	48,451	55,610	60,210	62,213	61,891
Induced Employment	35,961	83,361	122,384	174,970	235,004	227,129	209,920	200,430	176,478	146,600	147,076
Total Employment	107,921	247,560	359,298	506,034	666,766	635,535	576,673	540,523	467,973	383,250	379,050

EXHIBIT III-2:
TOTAL DIRECT AND INDIRECT EMPLOYMENT IMPACTS
(1985 - 1995)

BLS SECTOR \ YEAR	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	14.5	32.3	45.2	62.8	81.2	74.4	64.4	58.6	49.0	37.1	36.5
2	24.8	55.2	77.2	106.0	139.2	128.1	111.3	101.7	85.6	65.1	64.0
3	3.3	7.6	11.2	15.9	21.7	21.7	20.6	20.1	18.5	15.8	15.5
4	22.8	50.9	71.5	98.5	131.1	122.8	109.1	101.8	88.2	69.2	68.1
5	49.3	112.8	162.5	228.3	307.3	300.1	278.4	268.0	241.6	201.9	198.8
6	21.0	54.0	85.9	127.0	176.6	189.7	188.8	203.5	210.0	206.6	220.4
7	75.8	169.7	240.3	335.7	453.6	436.3	389.2	382.6	348.8	291.0	292.2
8	87.7	191.9	267.5	372.6	499.9	450.9	388.4	335.1	257.1	168.1	157.5
9	43.3	92.1	124.5	169.1	221.6	196.2	182.3	164.9	131.9	89.6	88.3
10	99.4	213.6	287.9	381.4	555.4	521.4	471.5	465.0	435.6	329.4	321.9
11	159.5	3013.9	8412.4	16605.8	28142.7	42172.3	56678.8	64619.4	69112.5	70345.0	68132.6
12	155.7	367.0	539.3	760.7	1100.3	1114.8	1083.7	1139.8	1144.1	1020.5	1068.1
13	493.7	1038.3	1371.9	1797.7	2276.5	2078.9	1801.8	1684.6	1471.1	1204.3	1118.8
14	28.2	62.7	87.7	120.1	189.5	190.5	188.7	192.3	187.0	146.5	142.5
15	466.7	1112.9	1678.7	2482.5	3552.6	3814.6	3848.3	3978.0	3867.9	3498.9	3471.2
16	8.2	18.0	24.8	33.8	43.4	38.5	32.0	27.8	21.4	14.7	14.1
17	0.8	1.5	2.4	4.6	8.8	10.7	11.5	9.4	6.7	4.1	3.7
18	19.3	43.2	60.8	83.8	110.1	100.0	86.5	80.0	67.9	51.5	50.9
19	5.1	11.0	15.1	20.5	26.2	23.2	20.1	17.9	14.5	10.5	9.9
20	9.9	22.4	31.9	44.3	58.4	53.3	45.8	42.0	35.3	26.7	26.1
21	6.2	13.9	19.8	27.5	38.0	36.1	32.5	31.1	27.9	21.9	21.3
22	8.2	18.2	25.6	35.3	45.9	41.6	35.7	31.7	25.6	18.5	17.4
23	1.2	2.7	3.9	5.5	7.5	7.1	6.5	6.1	5.3	3.9	3.8
24	2.6	5.9	8.4	11.7	15.6	14.5	12.8	11.7	9.7	7.2	6.9
25	5.7	12.4	17.0	23.1	30.0	26.9	22.6	20.2	16.4	11.9	11.2
26	4.4	9.7	13.4	18.3	24.1	22.3	19.7	17.8	14.6	10.8	10.3
27	7.1	16.1	23.2	32.7	44.7	43.0	39.7	38.2	34.0	27.2	26.8
28	1.6	3.6	5.1	7.0	9.2	8.4	7.3	6.6	5.5	4.0	3.8
29	59.1	137.5	202.1	286.4	382.5	370.2	356.1	351.3	325.6	278.3	268.9
30	1.1	2.6	3.7	5.2	6.8	6.1	5.3	5.2	4.6	3.8	3.6
31	58.9	131.7	184.3	253.0	332.2	296.4	252.4	218.3	169.5	113.4	107.2
32	8.9	20.0	28.3	39.1	51.5	47.7	44.1	42.2	37.3	29.8	29.0
33	38.1	88.5	129.1	182.5	244.4	236.0	223.7	217.6	198.1	166.6	162.7
34	21.7	49.1	69.4	96.1	130.6	121.3	108.3	99.0	83.5	61.4	59.8
35	50.5	125.7	196.6	291.9	408.2	443.1	449.2	460.2	446.5	407.6	389.5
36	78.8	173.4	240.9	328.6	436.5	384.8	320.7	292.4	243.3	168.5	163.9
37	81.8	182.9	256.8	353.7	484.7	441.2	382.9	346.4	288.4	198.6	191.9
38	5.6	12.6	18.0	25.0	32.7	28.1	21.6	19.4	15.6	10.3	10.5
39	6.9	15.4	21.4	29.3	45.7	41.4	37.0	33.4	27.9	14.5	14.0
40	12.7	28.2	39.5	54.2	533.7	528.9	521.4	532.2	538.4	101.5	99.7
41	202.5	454.8	641.9	887.6	1168.3	1088.9	970.4	906.2	781.8	618.3	600.2
42	109.9	240.2	329.3	443.5	571.6	497.9	415.2	359.9	278.6	184.0	174.2
43	141.7	319.9	453.7	633.0	851.0	808.2	737.8	694.8	600.4	471.8	464.6
44	54.1	123.2	175.7	246.1	329.0	310.2	276.4	259.6	224.7	177.8	178.3
45	232.0	521.9	740.0	1031.4	1372.3	1289.9	1166.1	1084.2	919.7	712.7	691.2
46	386.5	831.9	1126.0	1512.5	2507.2	2544.7	2485.6	2561.1	2527.6	1931.0	1871.3
47	13.2	34.9	57.2	89.0	145.6	182.3	213.9	233.1	238.8	221.2	210.4
48	61.3	146.5	220.7	320.4	448.6	467.2	478.5	495.6	483.9	436.4	425.6
49	64.4	145.1	205.0	283.2	391.4	370.0	336.8	320.4	286.8	223.5	215.1

EXHIBIT III-2:
TOTAL DIRECT AND INDIRECT EMPLOYMENT IMPACTS — (Continued)

BLS SECTOR \ YEAR	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
50	32.5	72.4	100.8	136.7	178.3	162.8	151.1	138.6	117.5	89.5	85.8
51	5.5	11.9	16.3	22.2	31.6	29.9	26.9	25.8	23.3	17.3	16.8
52	17.9	39.8	55.7	77.0	104.6	100.8	92.7	87.2	75.6	59.5	57.6
53	81.7	179.8	247.9	336.0	430.3	374.0	305.7	262.7	201.9	134.9	129.7
54	77.0	177.1	257.3	364.3	521.9	523.0	485.7	499.6	488.8	421.7	417.9
55	32.1	83.5	135.9	208.3	298.7	332.4	348.2	371.6	375.9	356.1	351.8
56	127.8	292.7	425.9	602.1	803.3	757.5	671.3	640.5	573.4	468.5	455.2
57	240.9	558.4	788.7	1092.4	1533.6	1490.2	1424.7	1246.0	971.5	643.3	610.4
58	0.9	1.9	2.6	3.4	4.8	4.5	4.1	3.6	2.9	2.0	1.8
59	7.5	16.6	23.3	32.0	41.9	38.2	33.4	31.1	26.4	20.2	19.7
60	69.3	153.9	214.4	292.9	377.6	329.3	269.0	234.8	184.6	125.9	123.7
61	1003.1	2166.2	2932.4	3919.5	5030.5	4437.0	3654.7	3264.7	2648.1	1917.4	1837.5
62	14.7	32.2	44.7	60.8	77.6	70.1	60.8	54.1	44.4	33.5	30.4
63	25.9	58.1	81.8	112.9	145.0	124.9	98.9	86.3	66.9	44.6	44.5
64	335.3	751.3	1060.1	1465.8	1886.1	1690.9	1431.9	1298.5	1085.8	834.4	826.0
65	1681.3	3610.9	4870.1	6465.8	8170.6	6911.2	5644.5	4800.4	3613.0	2272.0	2167.8
66	993.4	2149.2	2921.1	3906.6	4927.2	4142.2	3256.5	2758.9	2052.3	1263.7	1222.9
67	261.3	567.7	775.0	1044.0	1338.1	1157.2	926.7	803.3	621.9	411.6	399.9
68	303.4	659.0	898.5	1209.3	1557.3	1335.2	1056.2	890.9	656.4	393.4	375.4
69	461.6	990.6	1330.8	1767.5	2227.7	1869.8	1434.6	1182.4	836.5	474.0	457.3
70	15.1	33.6	47.1	64.7	87.4	81.8	72.7	67.7	58.3	44.3	41.5
71	43.2	95.0	131.3	178.6	227.7	196.5	156.8	136.4	105.8	71.4	70.8
72	753.1	1612.6	2166.3	2883.2	3753.1	3221.8	2564.2	2199.9	1676.1	1015.8	988.1
73	141.3	352.9	552.9	827.7	1170.0	1251.0	1273.4	1294.9	1243.4	1119.3	1094.5
74	115.7	256.2	355.1	482.9	625.8	549.0	452.8	388.4	296.5	193.3	184.3
75	194.2	433.1	606.5	832.4	1080.1	922.0	727.8	625.0	476.3	293.4	288.5
76	2637.8	5664.2	7624.8	10136.7	12694.9	10622.2	8098.3	6642.0	4647.5	2629.0	2521.4
77	119.2	263.3	367.5	505.7	678.3	642.7	576.7	541.9	472.8	372.3	358.6
78	55.0	122.8	172.5	237.5	306.7	278.4	237.6	213.4	174.3	130.5	124.5
79	160.7	505.7	934.2	1542.7	2372.3	3011.5	3437.3	3785.6	3921.2	3824.1	3726.6
80	67.2	165.6	257.2	383.3	1955.0	2006.8	2017.0	2073.6	2098.0	752.9	739.0
81	312.6	686.8	946.9	1287.0	1679.8	1468.3	1191.6	1026.6	781.9	493.3	475.2
82	142.3	310.6	423.9	570.6	749.4	647.9	523.2	444.6	333.9	197.1	190.6
83	8847.9	19049.9	25705.6	34245.1	42694.7	35195.5	26275.9	21177.3	14309.6	7449.4	7196.6
84	659.2	1442.9	1982.8	2678.1	3464.3	3019.0	2434.4	2137.8	1685.0	1127.5	1099.5
85	47.9	101.4	134.1	177.7	229.5	203.8	169.3	143.7	106.7	67.8	66.3
86	8.7	19.2	26.5	35.4	44.0	38.0	33.5	29.0	22.4	15.7	15.4
87	58.2	131.0	185.8	257.9	335.2	290.0	233.1	205.4	163.3	110.2	109.0
88	556.1	1167.6	1538.3	2014.8	2540.8	2138.2	1686.5	1373.6	941.0	496.9	471.5
89	508.9	1104.0	1509.9	2038.6	2611.8	2213.7	1720.1	1468.5	1104.7	675.4	658.4
90	13.3	29.5	41.4	56.9	72.8	64.0	53.2	47.4	38.9	28.8	27.8
91	943.1	2099.5	2914.4	3955.5	4975.9	4189.3	3298.1	2719.7	1950.5	1167.3	1154.7
92	6.7	14.0	18.4	23.8	29.2	24.7	22.0	19.3	15.3	10.8	10.1
93	17.1	38.2	53.9	74.7	95.8	82.4	65.4	58.0	46.6	32.6	32.4
94	47.8	102.9	140.4	188.3	235.6	190.8	138.2	117.8	89.1	53.1	52.8
95	418.2	868.0	1131.6	1468.2	1836.0	1566.0	1323.6	1098.8	784.7	469.0	443.3
96	115.2	250.7	345.6	470.0	592.7	492.4	369.3	318.7	242.9	152.9	153.3
97	119.8	264.9	369.0	502.5	644.1	563.5	469.0	417.4	340.1	245.2	237.0
98	194.5	425.8	585.6	792.6	1008.8	852.4	662.7	568.9	424.0	257.5	253.5

EXHIBIT III-2:
TOTAL DIRECT AND INDIRECT EMPLOYMENT IMPACTS -- (Continued)

BLS SECTOR \ YEAR	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
99	16.8	36.5	52.7	74.3	111.5	111.1	105.2	104.0	96.9	74.9	72.9
100	27.3	60.0	83.6	114.9	155.5	154.0	143.3	139.8	127.5	107.0	102.1
101	8.7	19.0	26.1	35.4	44.3	39.1	31.9	27.8	21.6	15.7	15.2
102	2.9	6.4	9.8	12.3	15.7	14.3	13.1	12.1	10.2	7.9	7.7
103	1509.0	3233.3	4313.0	5736.0	7608.5	6631.9	5541.1	4603.2	3230.3	1578.6	1548.3
104	52.4	115.0	158.1	215.7	287.5	257.1	212.5	191.3	154.1	102.3	105.8
105	28.1	58.8	77.6	101.7	128.5	106.2	82.4	68.3	48.7	26.3	25.2
106	44.3	96.6	132.4	178.8	224.1	196.6	160.2	139.3	108.2	77.7	74.8
107	16.8	37.0	51.5	69.9	88.3	72.2	54.3	45.0	32.8	18.8	17.9
108	7.8	16.9	23.3	31.6	39.9	33.1	25.0	22.2	18.0	12.4	12.9
109	8.3	18.5	25.9	35.4	45.2	40.2	34.8	31.4	26.0	19.5	19.1
110	82.1	179.6	248.8	335.3	430.6	388.0	343.5	318.0	271.3	210.6	202.5
111	400.2	961.5	1466.5	2142.7	3001.6	3227.7	3427.7	3555.7	3450.4	3114.0	2928.0
112	123.9	272.2	378.4	521.5	693.5	633.5	555.4	512.7	430.2	316.9	311.3
113	1601.7	3597.2	5093.2	7107.0	9636.3	9391.7	8689.0	8383.6	7566.1	6266.1	6090.9
114	91.2	218.3	328.2	472.8	656.6	687.3	677.4	711.7	705.1	649.0	643.5
115	251.6	559.1	785.4	1079.8	1430.8	1356.6	1227.4	1166.7	1032.7	841.9	814.8
116	8.6	20.4	30.2	42.9	60.7	61.6	58.7	61.1	60.0	53.2	53.2
117	113.2	263.7	386.0	551.1	766.6	791.7	734.4	731.4	696.5	622.7	639.8
118	112.3	257.3	368.8	518.1	699.7	667.4	578.9	540.8	470.8	375.0	381.8
119	492.9	1051.2	1428.8	1938.5	2505.6	2279.1	2037.5	1893.5	1599.8	1229.7	1185.8
120	278.3	642.2	932.7	1306.5	1853.0	1988.1	2025.3	2171.6	2213.1	2071.1	2028.7
121	79.9	182.9	262.7	369.0	514.4	494.0	448.6	437.1	397.4	316.4	316.8
122	35.1	80.5	116.9	168.5	245.6	289.7	325.0	364.6	389.0	387.9	383.0
123	4598.9	10307.0	14508.5	19956.0	26538.5	24467.8	21588.1	20258.0	17511.1	13484.2	13277.0
124	1006.9	2284.1	3249.3	4522.3	6008.9	5544.3	4861.8	4510.8	3825.8	2926.0	2950.2
125	366.3	817.5	1151.7	1596.2	2051.5	1879.1	1643.0	1500.1	1240.2	966.0	940.0
126	410.1	928.6	1326.2	1858.2	2479.4	2401.5	2196.5	2107.5	1882.5	1568.3	1538.6
127	308.2	698.6	991.9	1379.7	1852.9	1800.0	1592.5	1506.8	1351.9	1135.0	1168.0
128	246.0	576.1	851.5	1227.9	1689.4	1724.8	1667.4	1655.2	1539.2	1339.6	1305.5
129	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
130	492.8	1187.9	1816.6	2667.9	3665.5	3843.4	3927.4	4070.7	3930.0	3570.9	3457.1
131	916.8	2005.3	2756.7	3732.2	4647.7	3951.9	3059.0	2513.0	1755.3	1083.0	1054.1
132	245.9	553.0	779.7	1073.2	1396.0	1280.6	1089.1	1022.2	879.7	691.9	689.8
133	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
134	8156.8	18149.1	25257.9	34390.4	42841.9	38251.3	30636.5	26442.2	20703.7	15880.6	16542.8
135	76.3	174.6	250.6	350.5	468.5	439.8	390.7	369.2	321.6	254.9	253.5
136	914.6	2102.3	3027.7	4262.9	5721.6	5417.6	4809.8	4498.6	3889.5	3093.3	3143.1
137	339.0	787.3	1142.1	1602.6	2114.4	2016.7	1807.0	1717.4	1523.7	1277.2	1300.6
138	39.3	90.1	130.2	185.5	253.2	243.1	221.8	207.9	179.1	139.9	138.5
139	67.9	153.3	216.9	300.5	400.1	373.3	329.8	306.3	263.2	205.4	205.5
140	1.4	3.2	4.8	7.1	9.8	10.1	10.5	10.5	9.8	8.5	8.2
141	0.1	0.2	0.3	0.5	0.7	0.7	0.7	0.8	0.8	0.7	0.7
142	1.4	3.1	4.5	6.3	8.5	8.3	7.3	6.9	6.2	5.2	5.5
143	73.6	174.7	265.5	406.8	611.7	668.6	691.6	688.2	641.2	549.6	540.8
144	298.5	686.9	995.2	1408.5	1897.4	1842.5	1695.3	1626.6	1449.5	1197.3	1173.3
145	204.8	450.8	625.8	868.9	1144.3	1079.8	978.8	903.1	762.3	590.8	576.0
146	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
147	15.9	36.0	51.7	73.4	99.8	99.5	91.9	89.3	81.0	68.2	66.4

EXHIBIT III-2:
TOTAL DIRECT AND INDIRECT EMPLOYMENT IMPACTS — (Continued)

BLS SECTOR \ YEAR	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
148	57.2	132.2	191.6	270.8	370.0	344.4	312.8	289.9	245.0	181.8	183.2
149	122.2	288.8	429.4	620.4	882.2	959.1	1068.4	1149.7	1174.0	1122.6	1122.8
150	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
151	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
152	21000.0	48900.0	72600.0	101700.0	125700.0	115200.0	96900.0	82800.0	63300.0	48900.0	48000.0
153	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
154	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
155	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
156	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SUMS	71960.3	164199.3	236913.1	331063.9	431761.5	408406.3	366753.1	340093.4	291495.7	236649.8	231973.4

EXHIBIT III-3:

PROJECTED PERCENTAGE IMPORT PENETRATION BY BLS SECTOR IN 1995

BLS Sector	Import Penetration	BLS Sector	Import Penetration	BLS Sector	Import Penetration
1	0.0	53	0.1	105	13.6
2	0.7	54	6.3	106	8.2
3	0.1	55	26.4	107	52.3
4	0.2	56	22.9	108	37.0
5	4.3	57	2.9	109	16.6
6	35.3	58	9.2	110	8.0
7	0.0	59	49.7	111	0.9
8	29.3	60	5.3	112	0.0
9	0.5	61	1.7	113	0.0
10	40.4	62	7.5	114	-1.9
11	0.3	63	42.1	115	8.2
12	31.0	64	2.9	116	0.0
13	5.3	65	15.1	117	0.0
14	14.0	66	1.2	118	0.0
15	0.0	67	7.1	119	0.0
16	1.6	68	6.6	120	0.5
17	0.0	69	29.7	121	7.1
18	3.2	70	0.7	122	0.0
19	1.2	71	2.3	123	-2.9
20	3.2	72	0.8	124	0.0
21	0.4	73	11.1	125	0.0
22	0.9	74	0.7	126	0.0
23	24.9	75	7.2	127	0.0
24	13.2	76	6.5	128	0.9
25	8.3	77	6.5	129	0.0
26	0.7	78	10.5	130	0.0
27	1.5	79	4.5	131	0.0
28	1.0	80	6.7	132	0.0
29	6.1	81	6.7	133	0.0
30	2.3	82	14.1	134	0.0
31	10.6	83	8.0	135	0.0
32	1.2	84	0.2	136	0.0
33	21.6	85	7.4	137	0.0
34	3.1	86	10.7	138	0.6
35	0.2	87	1.2	139	0.0
36	15.7	88	6.2	140	0.0
37	5.0	89	4.0	141	0.0
39	4.6	90	7.6	142	0.0
40	2.7	91	1.6	143	0.0
41	5.7	92	35.1	144	0.2
42	0.1	93	0.9	145	0.0
43	1.5	94	5.5	146	0.0
44	1.7	95	14.2	147	0.0
45	1.0	96	7.9	148	0.0
46	6.0	97	14.3	149	0.0
47	5.4	98	7.6	150	100.0
48	2.4	99	5.8	151	51.0
49	3.3	100	4.4	152	0.0
50	2.9	101	59.2	153	0.0
51	2.8	102	1.1	154	43.7
52	0.7	103	2.8	155	0.0
		104	3.3	156	0.0

coal demand), on coal employment at the mine mouth and other indirect coal employment, and on induced employment are presented in the remainder of this chapter.

A. DIRECT AND INDIRECT EMPLOYMENT SUPPORTED BY PLANT CONSTRUCTION

A summary of the direct employment and the indirect employment supported by coal-to-methanol plant construction is provided in Exhibit III-1. All direct employment supported by construction is, of course, in the construction sector and is given in Exhibit III-1. A detailed breakdown of indirect employment supported by plant construction is provided in Exhibit III-4. Direct construction employment is expected to rise from 21,000 jobs in 1985 to 100,800 in 1989, then to decline to zero in 1994 when construction is scheduled to end. Indirect construction employment is at least twice the size of direct construction employment from 1985 through 1993, climbing from 50,960 jobs in 1985 to a high of 227,600 jobs in 1989, then declining to zero in 1994.

The industries where the largest indirect construction employment takes place are listed in Exhibit III-5. The peak employment year for construction, 1989, is used as the example year for the discussion of these impacts. In 1989, ten industries will account for 65 percent of the indirect construction employment impacts. The largest of these, General Industrial Machinery (BLS sector 83), will have an estimated employment of 39,529 jobs. Other particularly large employment levels are projected in Business Services (BLS sector 134), with 36,051 jobs, and Wholesale Trade (sector 123), with 20,596 jobs.

B. DIRECT AND INDIRECT EMPLOYMENT SUPPORTED BY PLANT OPERATIONS (EXCLUDING COAL-RELATED EMPLOYMENT)

The employment supported by coal-to-methanol plant operations will total 2,700 jobs in 1986. Total employment associated with operations (excluding coal) will peak in 1993 at 108,221 jobs when 24 of the 30 plants are fully operational and the remaining 6 plants are in the employment intensive start-up phase.[1] After 1993, employment will level off at about 97,000 jobs.

[1] Coal industry employment is not included in this discussion of operating employment. It is discussed separately later in this chapter.

EXHIBIT III-4:
INDIRECT CONSTRUCTION EMPLOYMENT
(1985 - 1995)

BLS SECTOR \ YEAR	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	14.5	31.3	42.1	55.9	64.8	58.4	33.9	22.9	9.1	0.0	0.0
2	24.8	53.3	71.8	95.3	110.5	85.9	57.8	39.0	15.6	0.0	0.0
3	3.3	7.1	9.5	12.6	14.7	11.4	7.7	5.2	2.1	0.0	0.0
4	22.8	49.0	66.0	87.4	101.6	79.0	53.2	35.9	14.3	0.0	0.0
5	49.3	106.2	142.9	189.0	219.9	171.1	115.1	77.7	31.0	0.0	0.0
6	21.0	46.4	63.2	82.9	94.2	71.6	46.4	32.7	13.8	0.0	0.0
7	75.8	162.1	217.9	291.3	342.3	268.6	178.1	124.7	51.4	0.0	0.0
8	87.7	188.5	257.3	352.0	422.7	336.4	236.6	157.7	61.4	0.0	0.0
9	43.3	90.6	120.1	160.3	189.0	148.3	113.3	79.7	32.7	0.0	0.0
10	99.4	211.9	283.0	371.9	427.5	327.1	216.6	147.3	59.0	0.0	0.0
11	159.5	343.3	466.3	632.4	762.0	608.7	444.2	300.4	119.6	0.0	0.0
12	155.7	345.8	475.4	634.3	740.2	575.8	389.1	275.5	116.1	0.0	0.0
13	493.7	1033.8	1358.9	1772.5	2023.3	1540.7	1008.5	662.6	254.7	0.0	0.0
14	28.2	60.9	82.3	109.6	128.1	99.5	68.3	46.3	18.5	0.0	0.0
15	466.7	1015.6	1387.5	1893.5	2271.6	1824.2	1254.9	867.9	353.4	0.0	0.0
16	8.2	17.6	23.6	31.5	36.8	28.8	19.5	13.1	5.2	0.0	0.0
17	0.8	1.5	2.4	4.4	7.6	8.2	7.4	4.7	1.7	0.0	0.0
18	19.3	41.9	56.8	75.9	88.1	68.0	45.9	31.5	12.8	0.0	0.0
19	5.1	10.7	14.2	18.5	21.0	15.9	10.8	7.2	2.8	0.0	0.0
20	9.9	21.7	29.6	39.9	46.6	36.1	24.2	16.4	6.6	0.0	0.0
21	6.2	13.4	18.2	24.4	28.4	22.0	14.7	10.0	4.0	0.0	0.0
22	8.2	17.7	23.9	31.9	37.0	28.6	19.2	12.8	5.0	0.0	0.0
23	1.2	2.7	3.6	4.9	5.8	4.6	3.2	2.1	0.8	0.0	0.0
24	2.6	5.7	7.8	10.5	12.3	9.6	6.6	4.4	1.7	0.0	0.0
25	5.7	12.0	16.0	21.0	24.2	18.6	12.2	8.2	3.2	0.0	0.0
26	4.4	9.4	12.5	16.4	19.1	14.9	10.2	6.8	2.6	0.0	0.0
27	7.1	15.5	21.3	28.9	34.2	27.1	18.8	12.9	5.2	0.0	0.0
28	1.6	3.5	4.7	6.3	7.3	5.6	3.7	2.5	1.0	0.0	0.0
29	59.1	126.2	168.9	221.9	250.4	186.2	125.5	84.8	33.9	0.0	0.0
30	1.1	2.4	3.3	4.4	5.0	3.7	2.4	1.6	0.7	0.0	0.0
31	58.9	128.9	176.0	236.5	276.9	216.3	149.0	98.8	38.5	0.0	0.0
32	8.9	19.0	25.3	33.2	37.8	28.5	19.6	13.4	5.4	0.0	0.0
33	38.1	82.7	111.9	148.6	170.8	130.4	89.0	60.4	24.2	0.0	0.0
34	21.7	47.5	64.5	86.3	101.3	79.4	54.6	36.7	14.6	0.0	0.0
35	50.5	105.2	137.8	178.9	202.1	151.6	98.3	65.0	25.5	0.0	0.0
36	78.8	169.1	228.2	303.6	348.9	264.8	174.4	119.4	48.2	0.0	0.0
37	81.8	178.0	242.1	324.5	378.4	293.6	198.7	133.4	52.8	0.0	0.0
38	5.6	12.4	17.4	23.8	27.8	21.3	13.5	9.5	4.0	0.0	0.0
39	6.9	15.1	20.6	27.6	32.2	25.1	17.5	11.8	4.7	0.0	0.0
40	12.7	27.7	38.1	51.3	59.7	46.0	30.6	21.0	8.5	0.0	0.0
41	202.5	435.5	585.3	776.2	898.7	693.2	467.2	315.8	125.8	0.0	0.0
42	109.9	236.0	317.2	419.7	483.7	371.4	252.5	168.8	66.1	0.0	0.0
43	141.7	307.3	414.3	558.6	660.0	523.1	364.5	250.5	101.1	0.0	0.0
44	54.1	118.4	161.5	217.7	257.3	203.3	139.1	95.8	39.1	0.0	0.0
45	232.0	502.1	680.9	913.9	1076.5	848.9	589.8	402.4	160.8	0.0	0.0
46	386.5	815.5	1078.4	1419.6	1649.3	1282.2	856.9	579.3	230.4	0.0	0.0
47	13.2	28.2	37.7	50.3	59.9	48.0	33.8	22.6	8.9	0.0	0.0
48	61.3	134.1	183.4	246.2	285.9	220.2	151.9	104.1	41.9	0.0	0.0
49	64.4	140.8	192.2	257.7	299.4	230.7	155.2	103.7	40.9	0.0	0.0

EXHIBIT III-4:
INDIRECT CONSTRUCTION EMPLOYMENT — (Continued)

BLS SECTOR \ YEAR	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
50	32.5	69.5	92.3	120.3	136.6	103.6	73.0	48.6	19.1	0.0	0.0
51	5.5	11.6	15.5	20.5	23.9	18.6	12.4	8.4	3.4	0.0	0.0
52	17.9	38.3	51.3	68.4	80.9	64.5	44.7	30.3	12.0	0.0	0.0
53	81.7	176.9	239.3	319.0	369.8	285.0	191.4	127.8	50.4	0.0	0.0
54	77.0	165.6	223.4	297.4	342.4	260.5	166.5	114.5	46.7	0.0	0.0
55	32.1	69.8	95.1	127.3	147.1	112.5	75.0	51.5	20.9	0.0	0.0
56	127.0	275.4	374.3	500.0	573.8	433.5	280.5	188.8	75.5	0.0	0.0
57	240.9	546.9	754.2	1023.0	1260.2	1067.1	818.5	544.3	209.8	0.0	0.0
58	0.9	1.8	2.4	3.1	3.5	2.7	1.9	1.2	0.5	0.0	0.0
59	7.5	16.1	21.7	28.7	33.1	25.4	17.2	11.7	4.7	0.0	0.0
60	69.3	151.3	206.6	277.4	322.7	249.0	166.7	112.8	45.3	0.0	0.0
61	1003.1	2154.4	2897.5	3850.7	4474.0	3467.7	2309.0	1556.4	615.9	0.0	0.0
62	14.7	31.0	41.1	53.7	60.6	45.2	29.6	19.0	7.2	0.0	0.0
63	25.9	57.3	79.4	108.1	126.7	98.0	64.8	44.7	18.3	0.0	0.0
64	335.3	727.0	987.8	1322.3	1529.5	1168.7	775.2	524.3	211.5	0.0	0.0
65	1681.3	3561.8	4727.2	6188.6	7047.4	5334.5	3623.0	2426.0	954.4	0.0	0.0
66	993.4	2126.2	2853.6	3774.2	4327.8	3290.5	2183.2	1476.1	589.0	0.0	0.0
67	261.3	558.3	747.5	990.0	1143.5	878.1	579.0	391.2	156.1	0.0	0.0
68	303.4	653.3	881.6	1175.9	1370.4	1064.4	711.5	478.9	189.1	0.0	0.0
69	461.6	986.4	1318.4	1743.2	2019.6	1561.8	1037.8	699.7	277.6	0.0	0.0
70	15.1	32.4	43.6	57.7	66.6	51.2	34.0	22.6	8.8	0.0	0.0
71	43.2	93.6	127.1	170.3	197.5	151.9	100.3	68.2	27.4	0.0	0.0
72	753.1	1606.1	2147.2	2845.6	3305.1	2563.5	1713.0	1159.6	462.5	0.0	0.0
73	141.3	310.8	426.3	574.7	672.7	524.1	356.3	240.5	96.1	0.0	0.0
74	115.7	251.7	341.5	456.1	531.4	413.0	279.8	186.7	73.3	0.0	0.0
75	194.2	428.3	592.0	803.1	936.9	720.8	477.6	325.6	131.7	0.0	0.0
76	2637.8	5635.4	7540.3	9971.2	11533.3	8902.6	5892.7	3968.3	1569.7	0.0	0.0
77	119.2	249.9	328.9	430.9	496.8	382.8	254.7	170.7	67.4	0.0	0.0
78	55.0	118.2	158.8	210.7	243.5	187.3	124.6	83.2	32.7	0.0	0.0
79	160.7	343.1	458.4	607.7	710.0	555.5	373.7	254.1	101.6	0.0	0.0
80	67.2	146.9	201.2	271.3	316.8	245.0	163.2	111.3	44.9	0.0	0.0
81	312.6	677.3	918.6	1230.9	1442.0	1127.0	759.5	514.3	204.5	0.0	0.0
82	142.3	308.5	417.6	558.1	653.1	510.2	346.4	233.4	92.6	0.0	0.0
83	8847.9	19825.4	25633.2	34102.3	39528.6	30474.3	20152.3	13622.6	5424.3	0.0	0.0
84	659.2	1415.4	1901.7	2519.0	2903.9	2229.1	1464.0	992.1	396.8	0.0	0.0
85	47.9	99.8	129.7	169.2	199.2	159.8	118.7	74.7	29.6	0.0	0.0
86	8.7	18.8	25.1	32.8	37.3	28.4	20.5	13.8	5.5	0.0	0.0
87	58.2	128.8	179.2	244.5	285.3	218.7	144.3	98.7	40.2	0.0	0.0
88	556.1	1163.9	1527.7	1994.3	2309.5	1802.0	1242.3	836.8	328.1	0.0	0.0
89	508.9	1092.1	1474.6	1968.9	2278.7	1745.0	1142.3	777.3	312.7	0.0	0.0
90	13.3	28.6	38.9	51.9	59.4	44.8	29.3	19.5	7.7	0.0	0.0
91	943.1	2085.2	2871.1	3868.9	4502.4	3479.8	2362.7	1588.9	636.4	0.0	0.0
92	6.7	13.6	17.3	21.7	23.6	17.1	12.1	7.9	3.0	0.0	0.0
93	17.1	37.4	51.7	70.3	81.5	61.9	40.2	27.6	11.3	0.0	0.0
94	47.8	102.1	137.9	183.3	207.1	152.5	93.8	64.3	26.4	0.0	0.0
95	418.2	858.1	1103.6	1415.0	1618.2	1252.4	898.4	599.6	233.0	0.0	0.0
96	115.2	248.3	338.5	455.9	525.7	396.8	252.9	175.3	72.5	0.0	0.0
97	119.8	257.5	347.2	459.6	523.7	394.0	259.2	173.4	68.8	0.0	0.0
98	194.5	422.3	575.3	771.9	897.4	691.2	458.5	317.5	129.4	0.0	0.0

EXHIBIT III-4:
INDIRECT CONSTRUCTION EMPLOYMENT — (Continued)

BLS SECTOR \ YEAR	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
99	16.0	34.3	46.1	61.3	71.4	55.6	37.2	25.2	10.1	0.0	0.0
100	27.3	55.5	71.0	91.0	103.4	78.9	51.5	34.4	13.5	0.0	0.0
101	8.7	18.4	24.3	32.0	36.9	28.5	18.8	12.7	5.1	0.0	0.0
102	2.9	6.2	8.3	10.9	12.4	9.5	6.7	4.5	1.8	0.0	0.0
103	1589.0	3230.4	4304.6	5719.4	6826.5	5529.9	4044.0	2783.1	1117.5	0.0	0.0
104	52.4	113.4	153.3	206.1	245.3	195.9	134.0	94.6	39.6	0.0	0.0
105	28.1	58.5	76.8	100.1	114.1	86.6	57.9	39.0	15.4	0.0	0.0
106	44.3	93.9	124.5	163.5	187.9	144.0	95.0	63.7	25.2	0.0	0.0
107	16.8	36.7	50.6	68.1	77.5	57.6	36.8	24.5	9.7	0.0	0.0
108	7.8	16.6	22.6	30.3	34.6	25.8	16.2	11.3	4.8	0.0	0.0
109	8.3	17.9	24.0	31.7	36.1	27.3	18.5	12.4	5.0	0.0	0.0
110	82.1	172.3	226.9	294.8	332.5	249.0	167.5	112.7	44.7	0.0	0.0
111	400.2	827.3	1082.2	1403.7	1582.8	1185.3	807.8	539.8	210.5	0.0	0.0
112	123.9	265.1	357.3	479.6	562.8	440.8	304.1	209.7	84.8	0.0	0.0
113	1601.7	3439.4	4627.9	6185.3	7243.8	5676.7	3837.8	2591.2	1031.3	0.0	0.0
114	91.2	197.8	267.3	353.4	404.7	309.2	203.8	140.0	56.8	0.0	0.0
115	251.6	527.4	694.0	903.5	1032.1	785.3	519.6	348.5	137.8	0.0	0.0
116	8.6	18.8	25.6	33.8	38.7	29.4	19.1	13.2	5.4	0.0	0.0
117	113.2	243.8	327.4	435.5	511.0	403.3	260.2	175.8	71.2	0.0	0.0
118	112.3	247.2	338.4	457.2	542.4	431.7	285.8	194.8	79.2	0.0	0.0
119	492.9	1012.3	1317.7	1723.2	1976.6	1512.2	1042.0	712.3	284.5	0.0	0.0
120	278.3	591.8	784.8	1019.9	1157.1	873.4	571.1	387.7	155.2	0.0	0.0
121	79.9	177.9	247.4	337.9	401.8	319.3	218.8	151.5	62.1	0.0	0.0
122	35.1	76.6	105.4	144.9	175.4	141.9	99.6	68.5	27.8	0.0	0.0
123	4598.9	9934.8	13405.8	17787.5	20595.5	15898.1	10736.0	7358.7	2971.2	0.0	0.0
124	1006.9	2213.7	3037.6	4099.0	4843.5	3817.3	2626.6	1819.9	745.3	0.0	0.0
125	366.3	787.2	1062.2	1418.9	1656.5	1289.1	881.1	600.3	240.2	0.0	0.0
126	410.1	875.5	1170.5	1552.1	1805.4	1405.0	941.8	638.9	255.8	0.0	0.0
127	308.2	662.7	886.7	1173.3	1369.5	1075.7	701.5	470.5	189.7	0.0	0.0
128	246.0	530.6	716.8	960.3	1126.9	883.5	597.9	405.6	162.1	0.0	0.0
129	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
130	492.8	1050.6	1412.1	1872.8	2149.8	1642.3	1120.7	770.1	308.8	0.0	0.0
131	916.8	1975.5	2668.4	3557.7	4162.1	3239.0	2161.7	1458.6	580.2	0.0	0.0
132	245.9	532.8	720.2	956.0	1103.3	851.7	558.6	385.6	156.9	0.0	0.0
133	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
134	8156.8	17562.1	23534.6	31023.6	36050.5	28165.9	18341.4	12295.0	4976.0	0.0	0.0
135	76.3	167.7	229.9	309.3	363.2	284.5	192.9	133.0	54.1	0.0	0.0
136	914.6	2023.1	2788.5	3782.1	4499.5	3580.4	2447.7	1683.3	687.5	0.0	0.0
137	339.0	748.2	1024.8	1370.2	1599.7	1250.9	840.2	575.0	234.4	0.0	0.0
138	39.3	86.7	119.9	164.7	198.0	159.3	111.5	76.5	31.0	0.0	0.0
139	67.9	147.6	200.8	267.0	312.7	244.7	165.9	112.9	45.6	0.0	0.0
140	1.4	3.0	4.1	5.5	6.6	5.2	3.8	2.6	1.0	0.0	0.0
141	0.1	0.2	0.3	0.4	0.4	0.3	0.2	0.2	0.1	0.0	0.0
142	1.4	3.0	4.0	5.4	6.4	5.1	3.4	2.3	0.9	0.0	0.0
143	73.6	161.7	225.7	322.5	410.3	347.5	253.7	173.6	69.9	0.0	0.0
144	298.5	648.1	879.8	1179.3	1381.4	1080.3	730.1	496.3	198.7	0.0	0.0
145	204.0	432.0	573.4	765.3	898.4	710.6	495.7	336.2	134.2	0.0	0.0
146	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
147	15.9	33.8	45.2	60.4	71.0	56.0	37.3	25.3	10.1	0.0	0.0

EXHIBIT III-4:
INDIRECT CONSTRUCTION EMPLOYMENT — (Continued)

BLS SECTOR \ YEAR	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
148	37.2	129.0	181.5	250.3	302.3	242.7	174.7	121.8	58.1	0.0	0.0
149	122.2	273.3	381.7	523.7	627.0	499.9	370.3	257.2	105.2	0.0	0.0
150	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
151	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
152	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
153	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
154	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
155	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
156	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SUMS	50960.3	109590.1	147411.6	195761.8	227571.3	176788.2	118478.9	80239.1	32135.8	0.0	0.0

EXHIBIT III-5:

INDIRECT CONSTRUCTION EMPLOYMENT - 1989

BLS Sector Name	Sector Number	Employment Impact (Number of Jobs)
Cement & Concrete Products	61	4,474
Blast Furnaces and Basic Steel Products	65	7,047
Fabricated Metal Products, nec.	76	11,533
General Industrial Machinery	83	39,529
Electric Lighting & Wiring	91	4,502
Scientific & Controlling Instruments	103	6,827
Truck Transportation	113	7,244
Wholesale Trade	123	20,596
Eating & Drinking Places	124	4,844
Business Services, nec.	134	36,051
Professional Services, nec.	136	4,500
	Subtotal:	147,147
	Total Indirect Employment:	227,572

All jobs supported by plant operations between 1986 and 1988 are jobs directly associated with operating the plants. Levels of direct employment supported by plant operation are shown in Exhibit III-1. Beginning in 1989, indirect employment appears, growing from being approximately equal in size to direct employment in 1989, to 130 percent of direct employment in 1993. Indirect employment levels off in 1994 and 1995 at 49,000 jobs, again approximately equal to direct employment.

Exhibit III-6 lists indirect operating employment by BLS sector and by year. As shown in Exhibit III-7, thirteen of these industries have annual indirect employment in excess of 1000 jobs in 1995.[1] These thirteen industries account for over 60 percent of all indirect employment from plant operations. Indirect employment is spread widely throughout all industry sectors, however. Another 54 sectors are projected to have an annual methanol-supported employment of 100 or more jobs each.

C. INDIRECT EMPLOYMENT IN COAL MINING AND ITS SUPPORTING INDUSTRIES DUE TO METHANOL PLANT OPERATIONS

Employment in the coal industry and its supplier industries will represent a large proportion of total annual indirect employment associated with coal-to-methanol plant operations. All coal-related employment will total 5,709 jobs initially in 1986 as coal stockpiling for the first six plants begins. Annual coal-related employment increases steadily through 1994 to 138,111 jobs, as stockpiling demand grows and full scale plant operations begin. When all plants are fully operational in 1995, total coal-related employment equals approximately 135,000 jobs. A summary of total coal-related employment, by year and by BLS sector, is provided in Exhibit III-8.

Methanol-supported employment in the coal mining industry grows steadily over the period from 1986 to 1994 (see Exhibit III-9), rising from 2,671 jobs in 1986 to 69,886 jobs in 1994. When all plants are fully operational, employment in coal mining totals approximately 68,000 jobs in 1995. Methanol-supported coal mining employment should stabilize at this level for the remainder of the century and into the first decade of the twenty-first century.

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[1] 1995 was chosen for detailed discussion because all plants will be fully operational by that year; the patterns observed then can be expected to continue through future operations.

EXHIBIT III-6:
INDIRECT EMPLOYMENT IMPACTS OF PLANT OPERATIONS
(1985 - 1995)

BLS SECTOR \ YEAR	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0.0	0.0	0.0	0.0	6.4	9.3	12.0	14.8	17.4	14.0	13.8
2	0.0	0.0	0.0	0.0	11.2	16.3	21.2	25.9	30.5	24.6	24.2
3	0.0	0.0	0.0	0.0	1.7	2.4	3.0	3.7	4.3	3.3	3.3
4	0.0	0.0	0.0	0.0	11.7	17.4	23.0	28.4	33.7	27.9	27.5
5	0.0	0.0	0.0	0.0	24.1	35.5	46.6	57.4	67.8	55.5	54.7
6	0.0	0.0	0.0	0.0	11.4	15.7	19.3	24.4	30.2	25.0	26.7
7	0.0	0.0	0.0	0.0	37.3	57.5	75.7	97.6	119.8	104.2	104.6
8	0.0	0.0	0.0	0.0	42.2	61.5	82.8	99.6	114.1	87.1	81.6
9	0.0	0.0	0.0	0.0	17.9	25.9	38.1	48.4	58.5	47.3	46.6
10	0.0	0.0	0.0	0.0	112.5	171.8	227.3	286.0	342.4	294.3	287.6
11	0.0	0.0	0.0	0.0	113.0	204.9	315.5	406.9	493.6	459.4	445.0
12	0.0	0.0	0.0	0.0	151.1	230.2	308.1	401.6	503.7	450.8	471.8
13	0.0	0.0	0.0	0.0	212.4	479.3	721.9	943.4	1134.4	1124.0	1044.2
14	0.0	0.0	0.0	0.0	44.1	65.4	87.8	108.7	128.5	105.6	102.7
15	0.0	0.0	0.0	0.0	280.0	464.2	647.8	836.3	1023.2	912.8	905.6
16	0.0	0.0	0.0	0.0	2.8	4.1	5.3	6.5	7.6	6.0	5.7
17	0.0	0.0	0.0	0.0	0.7	1.5	2.5	2.9	3.2	2.4	2.2
18	0.0	0.0	0.0	0.0	8.8	12.7	16.6	20.6	24.7	20.0	19.8
19	0.0	0.0	0.0	0.0	2.0	2.8	3.7	4.5	5.1	4.0	3.8
20	0.0	0.0	0.0	0.0	4.5	6.5	8.4	10.3	12.2	9.8	9.6
21	0.0	0.0	0.0	0.0	4.5	6.6	8.6	10.6	12.5	10.2	10.0
22	0.0	0.0	0.0	0.0	3.4	4.9	6.4	7.7	8.8	6.8	6.4
23	0.0	0.0	0.0	0.0	0.9	1.3	1.7	2.1	2.4	1.9	1.8
24	0.0	0.0	0.0	0.0	1.3	1.9	2.5	3.0	3.5	2.7	2.6
25	0.0	0.0	0.0	0.0	2.4	3.4	4.3	5.2	6.0	4.7	4.4
26	0.0	0.0	0.0	0.0	1.9	2.8	3.8	4.5	5.2	4.1	3.9
27	0.0	0.0	0.0	0.0	4.1	6.3	8.6	10.8	13.0	11.0	10.8
28	0.0	0.0	0.0	0.0	0.8	1.1	1.4	1.7	2.0	1.5	1.4
29	0.0	0.0	0.0	0.0	28.9	38.3	48.6	58.7	68.5	51.7	49.9
30	0.0	0.0	0.0	0.0	0.5	0.8	1.0	1.2	1.4	1.2	1.1
31	0.0	0.0	0.0	0.0	27.8	39.3	51.5	61.3	69.9	52.7	49.8
32	0.0	0.0	0.0	0.0	4.3	5.7	7.3	8.9	10.4	7.7	7.5
33	0.0	0.0	0.0	0.0	18.2	25.5	33.3	40.9	48.2	38.0	37.1
34	0.0	0.0	0.0	0.0	12.8	17.6	22.7	27.1	31.3	23.3	22.6
35	0.0	0.0	0.0	0.0	25.1	33.7	41.4	49.1	56.2	42.2	40.3
36	0.0	0.0	0.0	0.0	46.9	61.2	74.6	90.1	105.1	76.2	74.2
37	0.0	0.0	0.0	0.0	58.1	76.5	95.0	111.9	127.8	89.5	86.5
38	0.0	0.0	0.0	0.0	3.0	4.0	4.8	6.0	7.4	5.7	5.8
39	0.0	0.0	0.0	0.0	10.6	12.1	14.0	15.4	16.6	7.9	7.6
40	0.0	0.0	0.0	0.0	469.2	475.9	482.2	501.2	519.0	90.3	88.6
41	0.0	0.0	0.0	0.0	86.9	128.0	168.9	208.6	246.4	201.8	195.9
42	0.0	0.0	0.0	0.0	49.0	69.6	91.1	110.2	127.2	98.9	93.6
43	0.0	0.0	0.0	0.0	66.4	97.6	131.1	163.2	194.0	156.4	154.1
44	0.0	0.0	0.0	0.0	24.3	35.6	46.9	58.5	70.3	57.3	57.4
45	0.0	0.0	0.0	0.0	99.9	147.6	198.7	246.3	290.6	234.2	227.2
46	0.0	0.0	0.0	0.0	705.0	1036.9	1349.3	1662.5	1955.6	1583.9	1534.9
47	0.0	0.0	0.0	0.0	20.5	35.1	50.8	64.0	75.7	66.6	63.4
48	0.0	0.0	0.0	0.0	40.6	68.4	98.2	127.3	155.4	142.4	138.9
49	0.0	0.0	0.0	0.0	58.1	77.9	105.2	130.4	154.1	131.1	126.1

EXHIBIT III-6:

INDIRECT EMPLOYMENT IMPACTS OF PLANT OPERATIONS — (Continued)

BLS SECTOR \ YEAR	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
50	0.0	0.0	0.0	0.0	15.3	21.1	28.5	34.2	39.4	30.3	29.0
51	0.0	0.0	0.0	0.0	5.0	7.4	9.6	11.8	13.9	11.2	10.9
52	0.0	0.0	0.0	0.0	9.1	14.3	19.7	24.6	29.1	24.4	23.7
53	0.0	0.0	0.0	0.0	32.7	48.4	63.6	77.7	90.9	73.9	71.0
54	0.0	0.0	0.0	0.0	70.3	104.8	132.6	167.9	203.9	174.4	172.8
55	0.0	0.0	0.0	0.0	18.9	27.3	35.4	44.2	53.2	43.7	43.2
56	0.0	0.0	0.0	0.0	63.4	85.9	105.2	126.9	148.3	113.1	109.9
57	0.0	0.0	0.0	0.0	152.4	228.6	329.7	391.0	439.4	322.6	306.1
58	0.0	0.0	0.0	0.0	0.6	0.8	1.0	1.1	1.2	0.7	0.7
59	0.0	0.0	0.0	0.0	3.5	5.0	6.6	8.2	9.7	7.9	7.7
60	0.0	0.0	0.0	0.0	29.2	42.7	55.7	68.7	81.6	66.8	65.6
61	0.0	0.0	0.0	0.0	443.3	882.7	1140.2	1474.2	1782.9	1665.9	1596.5
62	0.0	0.0	0.0	0.0	5.8	8.8	11.7	14.0	15.8	12.9	11.7
63	0.0	0.0	0.0	0.0	10.2	15.1	19.5	24.6	29.8	25.0	25.0
64	0.0	0.0	0.0	0.0	121.4	181.0	237.2	295.0	354.0	299.0	296.0
65	0.0	0.0	0.0	0.0	676.0	934.0	1212.6	1461.9	1689.6	1299.6	1240.1
66	0.0	0.0	0.0	0.0	384.3	541.3	691.7	846.7	995.0	788.0	762.5
67	0.0	0.0	0.0	0.0	106.1	150.2	190.3	232.4	272.8	215.2	209.1
68	0.0	0.0	0.0	0.0	131.8	189.6	244.1	297.4	345.7	271.8	258.6
69	0.0	0.0	0.0	0.0	168.3	249.4	324.8	400.6	471.3	385.3	371.7
70	0.0	0.0	0.0	0.0	9.4	13.9	18.2	22.1	25.6	20.6	19.3
71	0.0	0.0	0.0	0.0	16.6	24.7	32.2	40.3	48.2	40.4	39.6
72	0.0	0.0	0.0	0.0	386.2	567.4	738.6	911.5	1075.4	874.8	851.0
73	0.0	0.0	0.0	0.0	77.8	106.4	135.4	162.6	188.9	140.7	137.6
74	0.0	0.0	0.0	0.0	50.3	70.8	91.2	109.4	125.8	95.7	91.3
75	0.0	0.0	0.0	0.0	94.8	130.5	163.5	199.5	235.8	181.4	178.4
76	0.0	0.0	0.0	0.0	890.3	1322.0	1718.0	2118.8	2487.2	2033.1	1949.9
77	0.0	0.0	0.0	0.0	59.3	81.1	101.6	121.5	140.0	104.5	100.7
78	0.0	0.0	0.0	0.0	19.3	26.9	34.0	40.9	47.1	35.9	34.2
79	0.0	0.0	0.0	0.0	114.0	157.3	197.7	238.7	277.4	205.0	200.6
80	0.0	0.0	0.0	0.0	1453.0	1490.0	1518.1	1575.7	1633.4	321.5	315.5
81	0.0	0.0	0.0	0.0	144.5	203.0	259.2	314.6	365.9	278.9	268.6
82	0.0	0.0	0.0	0.0	75.6	106.9	138.2	167.3	194.4	149.6	144.6
83	0.0	0.0	0.0	0.0	2931.6	4377.0	5702.9	7074.1	8370.3	6926.9	6691.0
84	0.0	0.0	0.0	0.0	300.5	411.0	509.2	616.7	719.9	547.0	533.4
85	0.0	0.0	0.0	0.0	16.1	23.3	30.9	37.5	43.5	33.6	32.0
86	0.0	0.0	0.0	0.0	2.5	3.5	4.9	6.0	7.1	5.7	5.6
87	0.0	0.0	0.0	0.0	27.0	39.2	49.7	61.4	73.4	58.0	58.1
88	0.0	0.0	0.0	0.0	197.6	286.1	380.3	464.1	536.2	419.9	398.5
89	0.0	0.0	0.0	0.0	218.0	302.4	376.1	459.5	541.0	418.6	408.0
90	0.0	0.0	0.0	0.0	5.3	7.7	10.0	12.2	14.4	11.9	11.5
91	0.0	0.0	0.0	0.0	330.0	500.1	671.9	831.4	991.4	836.4	827.3
92	0.0	0.0	0.0	0.0	2.3	3.0	4.1	4.9	5.5	4.2	3.9
93	0.0	0.0	0.0	0.0	6.9	9.9	12.5	15.7	19.0	15.7	15.6
94	0.0	0.0	0.0	0.0	20.7	27.2	31.7	38.9	46.6	36.3	36.1
95	0.0	0.0	0.0	0.0	131.0	187.0	257.0	309.5	353.3	271.3	256.4
96	0.0	0.0	0.0	0.0	43.9	62.5	77.4	97.6	119.4	99.5	99.7
97	0.0	0.0	0.0	0.0	51.2	70.0	89.3	107.0	125.0	98.2	94.9
98	0.0	0.0	0.0	0.0	77.4	111.4	142.9	179.7	216.0	176.1	173.3

EXHIBIT III-6:

INDIRECT EMPLOYMENT IMPACTS OF PLANT OPERATIONS — (Continued)

BLS SECTOR \ YEAR	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
99	0.0	0.0	0.0	0.0	18.7	23.8	28.7	33.7	38.4	25.5	24.9
100	0.0	0.0	0.0	0.0	13.6	19.2	24.2	29.3	33.8	26.5	25.3
101	0.0	0.0	0.0	0.0	1.8	2.5	3.1	3.8	4.4	3.3	3.2
102	0.0	0.0	0.0	0.0	1.1	1.6	2.2	2.7	3.2	2.7	2.6
103	0.0	0.0	0.0	0.0	753.9	1058.8	1438.4	1751.8	2039.1	1502.7	1473.9
104	0.0	0.0	0.0	0.0	26.1	36.9	47.5	59.8	73.0	57.8	59.7
105	0.0	0.0	0.0	0.0	11.8	15.9	20.0	24.0	27.7	20.7	19.8
106	0.0	0.0	0.0	0.0	11.2	16.2	20.7	25.3	29.5	23.6	22.7
107	0.0	0.0	0.0	0.0	7.9	10.4	12.6	15.0	17.3	13.0	12.4
108	0.0	0.0	0.0	0.0	3.1	4.3	5.2	6.7	8.4	7.1	7.4
109	0.0	0.0	0.0	0.0	3.2	4.3	5.5	6.7	7.8	6.1	5.9
110	0.0	0.0	0.0	0.0	33.5	47.0	61.3	74.9	87.6	70.0	67.3
111	0.0	0.0	0.0	0.0	238.4	363.9	500.3	622.0	727.5	615.0	579.0
112	0.0	0.0	0.0	0.0	61.0	89.1	118.0	148.7	177.3	143.6	141.1
113	0.0	0.0	0.0	0.0	863.4	1439.0	2000.9	2540.2	3051.0	2724.1	2648.0
114	0.0	0.0	0.0	0.0	58.2	97.3	132.0	173.3	213.2	197.6	195.9
115	0.0	0.0	0.0	0.0	113.3	159.0	202.3	245.3	285.4	224.4	217.2
116	0.0	0.0	0.0	0.0	7.2	10.0	13.9	17.0	21.6	18.7	18.7
117	0.0	0.0	0.0	0.0	63.4	100.4	129.0	162.5	196.0	173.5	178.3
118	0.0	0.0	0.0	0.0	54.0	80.9	103.2	127.4	152.5	124.6	126.9
119	0.0	0.0	0.0	0.0	179.1	258.6	346.5	431.4	509.5	411.4	396.7
120	0.0	0.0	0.0	0.0	235.3	454.4	654.3	866.0	1069.6	1057.5	1035.0
121	0.0	0.0	0.0	0.0	60.3	95.7	130.7	168.2	205.9	180.9	181.1
122	0.0	0.0	0.0	0.0	29.0	85.6	144.5	202.0	258.7	281.9	278.4
123	0.0	0.0	0.0	0.0	2386.1	3356.3	4328.3	5342.6	6329.7	5002.1	4925.3
124	0.0	0.0	0.0	0.0	456.0	666.5	883.1	1107.6	1335.6	1093.0	1102.1
125	0.0	0.0	0.0	0.0	101.9	156.0	213.3	268.2	320.1	271.6	264.3
126	0.0	0.0	0.0	0.0	169.6	251.1	328.0	407.2	482.9	396.6	389.1
127	0.0	0.0	0.0	0.0	142.1	215.1	275.7	338.9	405.6	344.2	354.2
128	0.0	0.0	0.0	0.0	117.6	179.0	238.0	297.5	353.5	294.7	287.2
129	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
130	0.0	0.0	0.0	0.0	222.0	325.6	435.0	546.5	649.6	534.0	517.0
131	0.0	0.0	0.0	0.0	196.4	285.6	368.0	451.0	530.2	425.5	414.1
132	0.0	0.0	0.0	0.0	101.1	148.1	189.4	230.6	287.2	230.0	237.9
133	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
134	0.0	0.0	0.0	0.0	1240.9	1863.4	2373.7	2907.9	3407.5	2961.5	3005.0
135	0.0	0.0	0.0	0.0	36.7	53.3	69.7	07.0	104.2	04.7	04.2
136	0.0	0.0	0.0	0.0	411.0	612.0	011.0	1012.0	1220.7	1010.7	1027.0
137	0.0	0.0	0.0	0.0	130.4	195.0	256.5	321.0	307.9	329.0	335.0
138	0.0	0.0	0.0	0.0	19.0	29.0	40.0	49.0	59.4	40.2	47.7
139	0.0	0.0	0.0	0.0	31.9	46.2	60.3	74.3	00.3	71.3	71.3
140	0.0	0.0	0.0	0.0	0.7	1.1	1.5	1.9	2.3	1.9	1.9
141	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.3	0.4	0.4	0.4
142	0.0	0.0	0.0	0.0	0.7	1.0	1.3	1.0	1.9	1.0	1.7
143	0.0	0.0	0.0	0.0	49.5	70.7	107.3	132.4	150.0	124.0	122.0
144	0.0	0.0	0.0	0.0	135.0	197.5	257.0	317.0	375.2	301.1	295.1
145	0.0	0.0	0.0	0.0	73.0	109.7	140.7	103.5	210.5	174.0	109.0
146	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
147	0.0	0.0	0.0	0.0	7.2	11.0	14.5	10.1	21.5	10.0	17.5

EXHIBIT III-6:

INDIRECT EMPLOYMENT IMPACTS OF PLANT OPERATIONS — (Continued)

BLS SECTOR \ YEAR	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
148	0.0	0.0	0.0	0.0	32.5	48.2	66.7	84.1	101.8	83.5	84.1
149	0.0	0.0	0.0	0.0	91.8	210.6	356.9	492.1	628.1	661.2	661.3
150	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
151	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
152	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
153	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
154	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
155	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
156	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SUMS	0.0	0.0	0.0	0.0	22182.3	32388.0	42152.3	51981.4	61421.8	49639.1	48592.7

EXHIBIT III-7:

SUMMARY OF INDIRECT EMPLOYMENT FROM

OPERATIONS FOR SELECTED INDUSTRIES - 1995

BLS Sector Name	BLS Sector Number	Employment
Stone and Clay Mining and Quarrying	13	1,044
Industrial Inorganic and Organic Chemicals	46	1,535
Cement and Concrete Products	61	1,597
Blast Furnaces and Base Steel Products	65	1,240
Fabricated Metal Products, nec.	76	1,950
General Industrial Machinery	83	6,692
Scientific and Controlling Instruments	103	1,474
Truck Transportation	113	2,648
Electric Utilities, Public & Private	120	1,036
Wholesale Trade	123	4,925
Business Services, nec.	124	1,102
Eating and Drinking Places	134	3,085
Professional Services, nec.	136	1,027
	Subtotal:	29,355
	Total Indirect Employment:	48,593

EXHIBIT III-8:
COAL-RELATED EMPLOYMENT: EMPLOYMENT AT THE MINE MOUTH, IN SUPPLIER INDUSTRIES, AND IN TRANSPORTATION AND WHOLESALE TRADE
(1985 - 1995)

BLS SECTOR \ YEAR	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0.0	1.0	3.1	6.1	10.0	14.8	18.4	21.0	22.5	23.1	22.7
2	0.0	1.8	5.4	10.7	17.5	25.9	32.2	36.8	39.5	40.5	39.8
3	0.0	0.6	1.7	3.3	5.4	8.0	9.9	11.3	12.2	12.5	12.3
4	0.0	1.9	5.5	10.9	17.8	26.4	32.9	37.5	40.3	41.3	40.6
5	0.0	6.6	19.6	38.6	63.3	93.5	116.6	132.9	142.8	146.4	144.1
6	0.0	7.6	22.7	44.1	71.0	102.4	123.1	146.4	166.0	181.6	193.7
7	0.0	7.6	22.4	44.4	74.0	110.2	135.4	160.2	177.6	186.8	187.6
8	0.0	3.4	10.2	20.6	35.1	53.0	69.0	77.8	81.6	80.9	75.8
9	0.0	1.5	4.4	8.8	14.7	21.9	31.0	36.8	40.7	42.4	41.7
10	0.0	1.7	4.9	9.5	15.5	22.5	27.6	31.7	34.2	35.1	34.3
11	0.0	2670.6	7946.1	15973.4	27267.6	41358.7	55919.2	63912.1	68499.3	69885.6	67687.6
12	0.0	21.2	63.9	126.4	209.0	308.7	386.6	462.6	524.4	569.7	596.3
13	0.0	4.5	13.0	25.2	40.7	58.9	71.4	79.2	82.0	80.3	74.6
14	0.0	1.8	5.3	10.5	17.4	25.6	32.6	37.3	40.0	40.9	39.8
15	0.0	97.3	291.2	589.0	1001.0	1526.2	1945.6	2273.9	2491.4	2586.1	2565.6
16	0.0	0.4	1.2	2.3	3.8	5.7	7.1	8.1	8.6	8.7	8.3
17	0.0	0.0	0.1	0.2	0.5	1.0	1.6	1.8	1.8	1.7	1.6
18	0.0	1.4	4.0	8.0	13.1	19.2	24.0	27.9	30.4	31.5	31.1
19	0.0	0.3	1.0	1.9	3.1	4.5	5.6	6.3	6.6	6.6	6.2
20	0.0	0.7	2.2	4.4	7.3	10.7	13.3	15.2	16.5	16.9	16.5
21	0.0	0.5	1.6	3.1	5.1	7.5	9.3	10.6	11.4	11.7	11.4
22	0.0	0.6	1.7	3.4	5.5	8.1	10.1	11.3	11.8	11.7	11.0
23	0.0	0.1	0.3	0.5	0.9	1.3	1.7	1.9	2.0	2.0	1.9
24	0.0	0.2	0.6	1.2	2.0	2.9	3.7	4.2	4.4	4.5	4.3
25	0.0	0.4	1.1	2.1	3.4	5.0	6.1	6.9	7.2	7.2	6.8
26	0.0	0.3	0.9	1.8	3.0	4.5	5.7	6.4	6.7	6.7	6.4
27	0.0	0.6	1.9	3.8	6.4	9.6	12.4	14.4	15.7	16.2	16.
28	0.0	0.1	0.4	0.7	1.2	1.7	2.1	2.4	2.5	2.5	2.4
29	0.0	11.3	33.2	64.5	103.2	145.7	181.9	207.7	223.2	226.7	218.9
30	0.0	0.1	0.4	0.8	1.2	1.7	2.0	2.3	2.5	2.6	2.5
31	0.0	2.8	8.3	16.6	27.5	40.7	52.0	58.2	61.1	60.7	57.4
32	0.0	1.0	3.0	5.8	9.4	13.5	17.2	19.9	21.6	22.1	21.5
33	0.0	5.8	17.3	34.0	55.4	80.2	101.4	116.4	125.7	128.5	125.6
34	0.0	1.7	5.0	9.8	16.3	24.3	31.0	35.2	37.6	38.1	37.1
35	0.0	20.5	58.8	113.1	181.0	257.8	309.6	346.2	364.8	365.4	349.1
36	0.0	4.3	12.7	25.0	40.7	58.7	71.7	82.9	90.0	92.3	89.8
37	0.0	4.9	14.7	29.2	48.2	71.1	89.2	101.1	107.8	109.1	105.5
38	0.0	0.2	0.6	1.2	1.9	2.8	3.3	3.9	4.3	4.6	4.7
39	0.0	0.3	0.9	1.7	2.9	4.2	5.5	6.2	6.6	6.7	6.4
40	0.0	0.5	1.5	2.9	4.8	7.0	8.6	10.0	10.9	11.2	11.0
41	0.0	19.3	56.7	111.4	182.8	267.7	334.3	381.8	409.5	416.5	404.3
42	0.0	4.1	12.2	23.9	39.0	56.8	71.5	80.8	85.2	85.1	80.6
43	0.0	12.6	37.4	74.4	124.6	187.5	242.1	281.1	305.3	315.3	310.6
44	0.0	4.8	14.2	28.4	47.5	71.3	90.4	105.2	115.4	120.5	120.9
45	0.0	19.9	59.0	117.4	195.9	293.4	377.7	435.5	468.3	478.4	464.1
46	0.0	16.4	47.6	92.9	152.9	225.6	279.4	319.2	341.6	347.1	336.4
47	0.0	6.7	19.5	38.7	65.2	99.2	129.3	146.5	154.3	154.5	147.0
48	0.0	12.4	37.3	74.2	122.1	178.6	228.3	264.3	286.5	294.0	286.7
49	0.0	4.3	12.8	25.5	41.9	61.4	76.5	86.3	91.7	92.4	88.9

EXHIBIT III-8: COAL RELATED EMPLOYMENT: EMPLOYMENT AT THE MINE MOUTH, IN SUPPLIER INDUSTRIES, AND IN TRANSPORTATION AND WHOLESALE TRADE — (Continued)

BLS SECTOR \ YEAR	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
50	0.0	2.9	8.5	16.4	26.4	38.0	49.6	55.8	59.0	59.2	56.8
51	0.0	0.5	0.8	1.6	2.7	4.0	4.9	5.6	6.0	6.1	6.0
52	0.0	1.5	4.4	8.7	14.5	22.0	28.3	32.4	34.5	35.1	34.0
53	0.0	2.9	8.6	16.9	27.8	40.7	50.6	57.1	60.6	61.8	58.7
54	0.0	11.5	33.9	66.9	109.2	157.7	186.7	217.2	238.3	247.3	245.1
55	0.0	13.7	40.8	81.0	132.7	192.6	237.8	275.9	301.9	312.4	308.7
56	0.0	17.3	51.6	102.1	166.0	238.1	285.5	324.8	349.5	355.4	345.3
57	0.0	11.4	34.5	69.3	121.0	194.5	276.5	310.7	322.3	320.7	304.3
58	0.0	0.1	0.2	0.4	0.6	0.9	1.2	1.3	1.3	1.2	1.1
59	0.0	0.6	1.7	3.3	5.3	7.7	9.7	11.2	12.0	12.3	12.0
60	0.0	2.6	7.8	15.6	25.7	37.6	46.7	53.4	57.7	59.1	58.1
61	0.0	11.8	34.9	68.8	113.2	166.6	205.5	234.1	249.3	251.5	241.0
62	0.0	1.3	3.6	7.1	11.3	16.0	19.4	21.1	21.4	20.5	18.6
63	0.0	0.8	2.4	4.9	8.1	11.9	14.6	17.0	18.7	19.5	19.5
64	0.0	24.3	72.3	143.5	235.2	341.2	419.4	479.3	520.3	535.4	530.1
65	0.0	49.1	142.9	277.2	447.2	642.7	808.9	914.5	969.0	972.3	927.8
66	0.0	23.8	67.5	132.4	215.8	310.4	381.6	436.0	468.2	475.7	460.3
67	0.0	9.4	27.5	54.8	88.4	128.9	157.5	179.8	193.0	196.5	190.9
68	0.0	5.7	16.9	33.4	55.1	81.3	100.7	114.5	121.6	122.4	116.8
69	0.0	4.2	12.4	24.3	39.9	58.5	72.1	82.1	87.7	88.7	85.6
70	0.0	1.2	3.5	7.0	11.4	16.6	20.5	23.0	24.8	23.7	22.2
71	0.0	1.4	4.2	8.3	13.6	19.9	24.3	27.9	30.2	31.0	30.4
72	0.0	6.5	19.1	37.5	61.7	90.9	112.6	128.8	138.2	140.9	137.1
73	0.0	42.1	126.6	253.0	419.5	620.5	781.7	891.8	958.5	978.6	957.0
74	0.0	4.5	13.5	26.8	44.2	65.2	81.8	92.3	97.4	97.6	93.8
75	0.0	4.8	14.6	29.3	48.4	70.6	86.7	99.9	108.8	112.0	110.1
76	0.0	28.8	84.5	165.5	271.2	397.5	487.6	554.9	590.6	595.9	571.5
77	0.0	13.4	38.5	74.8	122.2	178.8	220.4	249.7	265.4	267.8	257.9
78	0.0	4.6	13.6	26.8	43.9	64.1	79.0	89.2	94.4	94.6	90.3
79	0.0	162.6	475.8	935.0	1547.5	2298.7	2865.9	3292.8	3542.2	3618.3	3526.1
80	0.0	18.7	56.0	111.9	185.1	271.9	335.7	386.6	419.8	431.4	423.5
81	0.0	9.5	28.3	56.2	93.2	138.4	172.8	197.7	211.6	214.5	206.6
82	0.0	2.1	6.3	12.5	20.7	30.7	38.6	43.9	46.9	47.5	45.9
83	0.0	24.5	72.4	142.8	234.5	343.3	420.7	480.6	515.0	522.6	504.8
84	0.0	27.5	81.1	159.2	260.0	378.9	461.1	528.1	568.3	580.5	566.1
85	0.0	1.5	4.4	8.5	14.2	21.5	27.7	31.5	33.6	34.2	33.4
86	0.0	0.5	1.3	2.6	4.2	6.0	8.1	9.2	9.8	10.0	9.8
87	0.0	2.2	6.6	13.3	22.1	32.1	39.2	45.4	49.7	51.4	50.9
88	0.0	3.7	10.6	20.6	33.7	50.0	63.9	72.7	76.7	76.9	73.0
89	0.0	11.9	35.2	69.7	114.3	166.2	201.7	231.9	251.8	256.8	250.4
90	0.0	0.8	2.5	5.0	8.0	11.5	13.9	15.7	16.8	16.9	16.3
91	0.0	14.4	43.3	86.6	142.7	209.4	263.5	299.4	322.7	331.0	327.4
92	0.0	0.4	1.1	2.1	3.3	4.5	5.9	6.5	6.7	6.6	6.2
93	0.0	0.7	2.2	4.5	7.3	10.4	12.7	14.8	16.3	16.9	16.8
94	0.0	0.8	2.5	5.0	7.9	11.1	12.6	14.6	16.2	16.8	16.7
95	0.0	9.9	28.0	53.1	86.1	126.5	168.2	189.7	198.4	197.7	186.9
96	0.0	2.4	7.1	14.1	23.1	33.1	39.1	45.8	51.0	53.4	53.6
97	0.0	7.4	21.8	42.8	69.2	98.8	120.5	136.2	145.5	147.1	142.1
98	0.0	3.5	10.4	20.7	34.1	49.8	61.2	71.6	78.6	81.4	80.1

EXHIBIT III-8: COAL RELATED EMPLOYMENT:
EMPLOYMENT AT THE MINE MOUTH, IN SUPPLIER INDUSTRIES, AND IN TRANSPORTATION AND WHOLESALE TRADE — (Continued)

BLS SECTOR \ YEAR	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
99	0.0	2.2	6.6	13.0	21.4	31.7	39.3	45.1	48.4	49.4	48.1
100	0.0	4.5	12.6	23.9	38.5	55.8	67.5	76.2	80.3	80.5	76.8
101	0.0	0.6	1.7	3.4	5.5	8.1	9.9	11.3	12.1	12.3	11.9
102	0.0	0.2	0.7	1.4	2.2	3.2	4.2	4.8	5.1	5.2	5.1
103	0.0	2.9	8.5	16.6	28.1	43.3	58.7	68.2	73.7	75.9	74.4
104	0.0	1.6	4.8	9.5	16.1	24.4	30.9	36.9	41.5	44.5	46.1
105	0.0	0.3	0.8	1.6	2.6	3.7	4.6	5.2	5.6	5.6	5.4
106	0.0	2.7	7.9	15.3	25.0	36.4	44.5	50.4	53.6	54.1	52.1
107	0.0	0.3	0.9	1.8	2.9	4.1	4.9	5.5	5.8	5.9	5.6
108	0.0	0.2	0.7	1.4	2.2	3.1	3.6	4.2	4.8	5.2	5.4
109	0.0	0.6	1.9	3.7	6.0	8.6	10.8	12.3	13.2	13.5	13.2
110	0.0	7.3	21.0	40.5	64.7	92.8	114.7	130.4	139.0	140.6	135.1
111	0.0	134.1	384.3	739.0	1180.4	1678.5	2119.7	2393.8	2512.4	2498.2	2349.8
112	0.0	7.1	21.1	41.9	69.7	103.6	132.5	154.4	168.8	173.3	170.3
113	0.0	157.8	465.2	921.6	1529.1	2275.2	2850.3	3252.2	3483.0	3541.9	3442.9
114	0.0	28.6	80.9	119.4	193.6	280.8	341.6	398.3	435.1	451.4	447.6
115	0.0	31.7	91.4	176.3	285.4	412.3	505.5	572.9	609.5	617.5	597.6
116	0.0	1.6	4.7	9.1	14.8	21.3	25.7	30.0	33.0	34.5	34.5
117	0.0	19.9	58.6	115.6	192.2	288.0	344.4	393.1	428.5	449.2	461.5
118	0.0	10.1	30.4	60.9	102.4	154.8	189.9	218.6	239.1	250.4	254.9
119	0.0	39.0	111.1	215.3	349.9	508.3	649.0	749.8	805.9	818.3	789.1
120	0.0	51.2	148.7	286.6	460.6	660.2	799.9	917.8	988.3	1013.6	992.8
121	0.0	5.0	15.3	31.1	52.3	79.0	99.9	117.4	129.4	135.6	135.7
122	0.0	3.8	11.6	23.6	40.5	62.2	80.9	94.1	102.5	106.0	104.6
123	0.0	373.8	1102.6	2168.5	3557.0	5213.4	6523.8	7556.7	8210.3	8482.0	8351.7
124	0.0	78.4	211.7	423.3	708.7	1060.5	1352.2	1583.3	1744.8	1832.9	1848.1
125	0.0	38.3	89.5	177.2	293.1	433.1	548.6	631.6	679.9	694.4	675.7
126	0.0	53.2	155.8	306.1	504.4	745.4	925.9	1061.4	1143.8	1171.7	1149.5
127	0.0	35.9	105.3	206.4	341.4	509.1	615.3	697.4	756.6	790.8	813.8
128	0.0	45.5	134.8	267.6	444.9	662.3	830.6	952.2	1023.8	1045.0	1018.4
129	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
130	0.0	137.4	404.5	795.1	1292.9	1875.5	2371.6	2754.1	2971.6	3036.1	2939.4
131	0.0	29.8	88.3	174.5	289.2	427.3	528.4	602.6	644.9	657.6	640.0
132	0.0	20.1	59.5	117.1	191.5	280.7	341.1	398.0	435.6	453.0	451.2
133	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
134	0.0	587.0	1723.2	3366.8	5542.5	8222.0	9921.4	11239.3	12240.2	12919.1	13457.8
135	0.0	6.9	20.7	41.2	68.6	102.0	128.2	149.3	163.4	170.2	169.3
136	0.0	79.2	239.2	480.8	810.4	1224.4	1551.0	1802.6	1981.2	2082.6	2116.1
137	0.0	39.1	117.3	232.4	384.4	570.7	710.3	821.5	901.3	948.2	965.6
138	0.0	3.4	10.2	20.8	35.5	54.2	70.3	81.5	88.7	91.8	90.8
139	0.0	5.7	16.9	33.5	55.5	82.4	103.6	119.1	129.3	134.1	134.2
140	0.0	0.3	0.8	1.5	2.6	3.8	5.2	6.0	6.4	6.5	6.3
141	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.3	0.3	0.3	0.4
142	0.0	0.1	0.4	0.9	1.4	2.2	2.7	3.0	3.3	3.5	3.7
143	0.0	13.0	39.8	84.3	152.0	244.4	330.6	382.2	414.5	425.6	418.8
144	0.0	38.8	115.4	229.2	380.4	564.8	707.3	812.5	875.5	896.2	878.2
145	0.0	18.0	52.4	103.6	172.3	258.7	334.5	383.3	411.7	416.8	406.4
146	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
147	0.0	2.2	6.6	13.0	21.7	32.5	40.0	45.9	49.3	50.2	48.9

EXHIBIT III-8: COAL RELATED EMPLOYMENT: EMPLOYMENT AT THE MINE MOUTH, IN SUPPLIER INDUSTRIES, AND IN TRANSPORTATION AND WHOLESALE TRADE — (Continued)

BLS SECTOR \ YEAR	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
148	0.0	3.3	10.0	20.5	35.1	53.5	71.4	84.1	93.1	98.4	99.1
149	0.0	15.6	47.6	96.8	164.2	248.6	341.2	400.4	440.7	461.4	461.5
150	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
151	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
152	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
153	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
154	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
155	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
156	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SUMS	0.0	5709.2	16981.5	33602.9	56307.7	84206.0	109229.9	125072.9	134639.0	138110.7	135380.7

EXHIBIT III-9:

ANNUAL COAL-MINING EMPLOYMENT SUPPORTED

BY A DOMESTIC METHANOL INDUSTRY

1985 - 1995

Year	Number of Jobs
1985	0
1986	2,670.6
1987	7,946.1
1988	15,973.4
1989	27,267.6
1990	41,358.7
1991	55,919.2
1992	63,912.1
1993	68,499.3
1994	69,885.6
1995	67,687.6

Employment in coal mining, and in the transportation and wholesale trade sectors which distribute the coal to the plants, amounts to at least half of the total coal-related employment throughout the 1986 to 1995 period. Methanol-supported employment in these sectors grows from 2,958 jobs in 1986 to 75,898 jobs in 1994. It declines slightly to 73,490 jobs in 1995, with actual coal mining employment accounting for at least 90 percent of these jobs.

Methanol-supported employment in industries supplying the coal industry will total 2,751 jobs in 1986, increasing to about 62,000 jobs in 1994 and 1995. Including the transportation and wholesale trade sectors, eleven industries will have employment in excess of 1000 jobs by 1995 as a result of methanol-supported demand for coal. These industries are listed in Exhibit III-10. An additional 59 industries will have indirect employment of 100 or more jobs, with 15 of these having 500 or more jobs a year.

D. TOTAL INDUCED EMPLOYMENT: THE EFFECT OF PLANT CONSTRUCTION AND OPERATION ON PERSONAL CONSUMPTION EXPENDITURES

The direct and indirect employment supported by coal-to-methanol plant construction and operation increase personal income and personal consumption expenditures, leading to further employment. These employment effects are referred to as induced employment. Total induced employment estimates for each year are presented in Exhibit III-11 for the period from 1985 through 1995.

Induced employment is expected to grow from almost 36,000 jobs in 1985 to 227,000 jobs in 1990. It is then expected to decline to about 147,000 jobs in 1994 and 1995. Induced employment is a significant portion of the total level of employment supported by this industry throughout the analysis period. In 1985, it amounts to 33.3 percent of total methanol-supported employment. This percentage increases by 0.3 to 0.6 points per year until 1995, when it reaches 38.8 percent.

Exhibit III-11 also presents the annual total employment multipliers that were used to calculate total induced employment for each year from 1985 to 1995. Data is also presented in the exhibit to show how each of these multipliers were derived. For example, in 1990 direct and indirect employment supported by the methanol industry

EXHIBIT III-10:
COAL-RELATED EMPLOYMENT:
EMPLOYMENT IN SUPPLIER INDUSTRIES AND
IN TRANSPORTATION AND WHOLESALE TRADE - 1995

BLS Sector Name	BLS Sector Number	Employment
Maintenance and Repair Construction	15	2,566
Construction, Mining & Oilfield Machinery	79	3,526
Railroad Transportation	111	2,349
Truck Transportation	113	3,443
Wholesale Trade	123	8,352
Eating and Dining Places	124	1,848
Banking	126	1,150
Insurance	128	1,018
Real Estate	130	2,939
Business Services, nec.	134	13,458
Professional Services, nec.	136	2,116
	Subtotal:	42,765
	Employment Total: (Excluding Mine Mouth)	67,693

EXHIBIT III-11:

INDUCED EMPLOYMENT: MULTIPLIERS AND PROJECTED INDUCED EMPLOYMENT

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Total direct and indirect employment	71,960	164,199	236,913	331,064	431,762	408,406	366,753	340,093	291,496	236,650	231,973
Initial induced employment	23,978	55,291	80,698	114,471	152,176	145,957	133,505	126,109	109,926	90,523	90,009
Ratio of initial induced employment to total direct and indirect employment	.3332	.3367	.3406	.3458	.3525	.3574	.3640	.3708	.3771	.3825	.3880
Total employment multiplier	1.4997	1.5077	1.5166	1.5285	1.5443	1.5561	1.5724	1.5893	1.6054	1.6195	1.6340
Total induced employment	35,961	83,361	122,384	174,970	235,004	227,129	209,920	200,430	176,478	146,600	147,076

totaled 408,406 jobs. Following the method presented in Chapter II, Section H, the BLS interindustry model and the BLS labor demand model were used to estimate that 145,957 jobs would be supported by the projected personal consumption expenditures (PCE) of these individuals. Since the ratio of the initially estimated induced employment to the sum of direct and indirect employment was .3574, the estimated total employment multiplier was determined to be 1.5561. Consequently, total induced employment was estimated to be 227,129 jobs [i.e., (1.5561)(408,406)-408,406 = 227,129].[1]

E. REGIONAL EMPLOYMENT EFFECTS: A QUALITATIVE ANALYSIS

The employment estimates presented above are estimates of the employment supported by a methanol fuel production industry at the national level. They do not reflect the regional distribution of this employment, nor do they depict the dynamic adjustment of regional job markets to the existence of the industry. They simply represent the total employment in each sector of the economy, supported by the industry, at the national level. Futhermore, they should be interpreted as average, not marginal, estimates of the employment associated with the projected level of industry activity.

Although a determination of the regional distribution of the estimated total employment supported by a coal-to-methanol industry was not included in this analysis, several conclusions about regional effects may be drawn from these estimates. For example, one would expect a significant portion of the indirect and induced employment supported by the construction and operation phases to occur within the states in which the methanol synthesis plants are located (in conjunction with direct construction and operation employment impacts) and in neighboring states. Similarly, one would expect a significant portion of the indirect employment associated with coal mining to occur in those states where coal is mined; significant levels of induced employment would also, consequently, exist in these states. The magnitude of these latter state level effects would increase greatly, and the regional distribution of direct, indirect, and induced

[1] Note: The actual multipliers used were carried to nine decimal points. For example, the multiplier 1.5561 is actually 1.556134716. If this multiplier is used, the correct induced employment estimate of 227,129 is generated. If the multipliers in Exhibit III-11 are used, the results will differ slightly from the estimates presented, i.e. (1.5561)(408,406)-408,406 = 227,115, not 227,129.

employment narrow greatly, if the synthesis plants are located in or bordering on the states in which coal is mined. In general, the greater the geographic concentration of the methanol fuel production industry and its supplier industries, the narrower the regional distribution of the employment associated with the industry.

Furthermore, the greater the importance of a given state to a sector of the economy that is important to the methanol fuel production industry, the greater the likelihood that the state will experience a significant employment impact from the development of the industry. What are these sectors and states?

Exhibit III-12 presents those sectors of the economy that experience direct and indirect employment associated with the methanol industry in excess of 5000 jobs for the years 1990 (10 sectors) and 1995 (5 sectors). Excluding direct construction and operation employment, these sectors account for over 60 percent of all jobs associated with the industry in each of these years. Exhibit III-13 lists the key states and their combined output share for each of the sectors (except for transportation and service sectors 113, 123, 124, 134, and 136),[1] as identified by Jack Faucett Associates during the construction of a multiregional input-output model for the U.S. Department of Health and Human Services.[2] Given this information, it is reasonable to expect that these states would experience significant employment related to the development of a methanol fuel industry. They are located predominantly in the Midwest, and to a lesser degree in the Northeast.

These are the general conclusions concerning regional employment effects that can be drawn from this analysis. In order to quantify regional differences in the distribution of employment associated with a methanol fuel industry, and to characterize the dynamic adjustment of regional labor markets to the existence of the industry, a formal regional analysis must be conducted.

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[1] Output in the transportation and service sectors is greater in some states than in others due to demographic factors. Consequently, it is not appropriate to identify key states for these sectors.

[2] Jack Faucett Associates. The Multiregional Input-Output Accounts, 1977. U.S. Department of Health and Human Services, 1983.

EXHIBIT III-12:

DIRECT AND INDIRECT EMPLOYMENT IN KEY ECONOMIC SECTORS IN 1990 AND 1995

BLS Sector	1990	1995
Total Direct and Indirect Employment	408,406.3	231,937.4
11 - Coal Mining	42,172.3	68,132.6
65 - Blast Furnaces and Basic Steel	6,911.2	2,167.8
76 - Fabricated Metal, nec.	10,622.2	2,521.4
83 - General Industrial Machinery	35,195.5	7,196.6
103 - Scientific and Controlling Instruments	6,631.9	1,548.3
113 - Truck Transportation	9,391.7	6,090.9
123 - Wholesale Trade	24,467.8	13,277.0
124 - Retail Trade	5,544.3	2,950.2
134 - Business Services, nec.	38,251.3	16,542.8
136 - Professional Services, nec.	5,417.6	3,143.1
152 - Construction and Operation Employment	115,200.0	48,000.0
Total Employment minus Sector 152	293,206.3	183,973.4
Subtotal of remaining sectors	184,605.8	111,239.9
Remaining sectors share	.630	.605

EXHIBIT III-13:
KEY STATES BY SECTOR

11 - COAL MINING

West Virginia
Kentucky
Pennsylvania
Virginia
Ohio
Illinois
Indiana
Share = 84.0%

65 - BLAST FURNACES AND BASIC STEEL PRODUCTS

Pennsylvania
Ohio
Indiana
Illinois
Michigan
Share = 71.1%

76 - FABRICATED METAL, NEC

Ohio
California
Illinois
Michigan
Pennsylvania
Texas
Share = 55.8%

83 - GENERAL INDUSTRIAL MACHNINERY

Ohio
California
Illinois
Pennsylvania
New York
Michigan
Share = 51.4%

103 - SCIENTIFIC AND CONTROLLING INSTRUMENTS

New York
Massachusetts
California
Illinois
Share = 56.8%

CHAPTER IV:
METHANOL-RELATED EMPLOYMENT IN PERSPECTIVE

The annual employment projections presented in Chapter III are estimates of the absolute level of employment supported by the development of a 2.5 million BPD domestic methanol industry. How significant are these employment estimates, however? Will the development of a domestic methanol fuel industry employ a large share of the country's workforce? Does the capital expended on its development generate more employment than equal expenditures on other types of economic activity? Is the cost of creating the industry comparable to the dollar value of displaced oil imports? These questions and other issues are addressed in this chapter.

A. METHANOL-RELATED EMPLOYMENT AND THE NATION'S LABOR FORCE

A 2.5 million BPD domestic methanol industry should support less than one-half of one percent of the nation's civilian labor force, through direct, indirect, or induced employment, in all but two years between 1985 and 1995. As shown in Exhibit IV-1, the methanol-related share of the civilian labor force ranges from a low of less than one-tenth of one percent in 1985 to 0.54 percent in 1989. It declines from 1989 until 1994 and 1995, when it stabilizes at about three-tenths of one percent (379,000 jobs).

Methanol-related employment in the coal mining industry is estimated to total almost 68,000 jobs in 1995. This is a substantial share of the 317,000 coal mining jobs currently projected by the BLS for that year (21.5 percent).[1] In fact, the methanol industry's greatest proportional effect on employment occurs in the coal mining industry.

B. METHANOL-RELATED EMPLOYMENT AND REGIONAL CONSIDERATIONS

What if all of the jobs supported by the development of a 2.5 million BPD domestic methanol industry existed within a limited geographic region, such as the Midwest? As

[1] Personick, Valerie A. "The Job Outlook Through 1995: Industry Output and Employment Projections." Monthly Labor Review, November 1983, pp. 24-36

EXHIBIT IV-1:
PROJECTED ANNUAL METHANOL-RELATED JOBS: SHARE OF CIVILIAN LABOR FORCE

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Projected Civilian Labor Force (000)[1]	116,978	118,693	120,421	122,002	123,563	124,951	126,350	127,587	128,860	130,102	131,387
Projected Methanol-Related Jobs (000)	108	248	359	506	667	636	577	541	468	383	379
Methanol-Related Jobs: Share of Labor Force (%)	0.09	0.21	0.30	0.41	0.54	0.51	0.46	0.42	0.36	0.29	0.29

[1] U.S. Department of Labor, Bureau of Labor Statistics, Monthly Labor Review, November 1983 for 1990 and 1995. Unpublished data from BLS for remaining years.

shown in Exhibit IV-2, total methanol-related employment would equal about 1.5 percent of estimated total employment in 1995 for the seven states of Pennsylvania, Ohio, Michigan, Illinois, Indiana, West Virginia, and Kentucky (each of which was identified in the previous chapter as a key state in the development of the industry). The industry's share of total employment in these states over the period from 1985 to 1995 would range from 0.46 percent in 1985 to 2.74 percent in 1989. The impact of the domestic methanol industry on coal mining and construction employment in these states would be very significant.

C. METHANOL CONSTRUCTION EMPLOYMENT VS. CONSTRUCTION EMPLOYMENT EFFECTS OF OTHER PROJECTS

The construction of 30 methanol fuel production plants will support 508,500 direct construction jobs, and a total of 1,647,340 direct and indirect construction jobs, over the period from 1985 to 1995. Since each plant will cost a little over $3 billion (1981 dollars) to build, the total cost of all the plants is $91.2 billion. Thus, the expenditure of $1 billion (1981 dollars) on the construction of a methanol fuel production facility will support 5,650 direct construction jobs and a total of 18,300 direct and indirect construction jobs.

How does this compare with the level of direct and indirect employment associated with other construction activity? As shown in Exhibit IV-3, public works construction projects employ, on average, 12,100 people directly and a total of 17,800 people for every $1 billion (1981 dollars) expended. Thus, the construction of a methanol plant directly employs fewer people per billion dollars expended than the average public works project, but it employs more people directly and indirectly per billion dollars expended. This result may reflect the value of the primary and intermediate inputs into the construction of the plant, as well as the labor requirements associated with the production of those inputs.

D. TOTAL METHANOL-SUPPORTED EMPLOYMENT VS. TOTAL EMPLOYMENT SUPPORTED BY SIMILAR EXPENDITURES IN OTHER SECTORS: 1985 THROUGH 2020

The construction and operation of 30 fuel methanol production plants over the period from 1985 through 2020 (the projected lifetime of the plants) will require a total

EXHIBIT IV-2:

PROJECTED ANNUAL METHANOL-RELATED JOBS:

SHARE OF PROJECTED EMPLOYMENT FOR KEY STATES[1]

1985 - 1995

Year	Estimated Total[2] Employment	Methanol-Related[3] Employment	Share (%)
1985	23,300,700	108,000	0.46
1986	23,548,100	248,000	1.05
1987	23,798,100	359,000	1.51
1988	24,050,700	506,000	2.10
1989	24,306,000	667,000	2.74
1990	24,564,000	636,000	2.59
1991	24,824,800	577,000	2.32
1992	25,088,400	541,000	2.16
1993	25,354,700	468,000	1.85
1994	25,623,900	383,000	1.49
1995	25,895,900	379,000	1.46

[1]West Virginia, Kentucky, Pennsylvania, Ohio, Illinois, Indiana, Michigan.

[2]Derived from The Multiregional Input-Output Accounts, 1977. By Jack Faucett Associates for the U.S. Department of Health and Human Services, 1983.

[3]Assumes all methanol related employment occurs in the seven states considered.

EXHIBIT IV-3:

METHANOL CONSTRUCTION EMPLOYMENT VS.
ESTIMATED EMPLOYMENT PER BILLION DOLLARS
FOR VARIOUS PUBLIC WORKS PROJECTS
(1981 Dollars)

Type of Project	Direct Labor Requirements	Total Labor Requirements
Methanol Plant Construction	5,650	18,300
Building Construction		
Private one-family housing	6,900	12,200
Public housing	11,500	16,400
Schools	9,700	15,700
Hospitals	10,800	16,700
Nursing homes	10,700	16,500
College housing	12,100	17,600
Federal office buildings	12,000	17,500
Heavy Construction		
Highways	7,300	13,000
Sewer Works		
Lines	9,800	15,400
Plants	10,600	16,800
Civil Works		
Large earth-fill dams	13,900	18,100
Small earth-fill dams	14,200	19,400
Local flood protection	16,400	21,300
Pile dikes	13,400	19,400
Levees	15,900	18,200
Revetments	6,200	16,200
Powerhouse construction	9,500	19,800
Medium concrete dams	15,600	20,600
Large multiple-purpose projects	17,800	22,900
Dredging	16,400	19,900
Lock and concrete dams	11,800	19,700
Miscellaneous	12,600	17,800
Mean	12,100	17,800

Source: Developed from data in Table 5.2 of Regional Cycles and Employment of Public Works Investments. George Vernez et.al., The Rand Corporation. Prepared for the Economic Development Administration, January 1977.

expenditure of $445.4 billion (unamortized 1981 dollars). Construction of the 30 plants will require $91.2 billion; operation of the plants will require the remaining $354.2 billion (see Appendix A-8 for further details). Methanol-supported employment over the period will total 13,218,460 jobs, or 29,676 jobs per billion dollars expended. This estimate includes all direct, indirect, and induced employment.

Exhibit IV-4 compares the total employment supported by the fuel methanol industry from 1985 through 2020 with the total employment (direct, indirect, and induced) supported by an identical level of total expenditure in six other sectors over the same period. These sectors, and the relevant breakdown of total expenditures in each, are defined as follows:

- Defense Expenditures (General) — $445.4 billion is spent on all types of defense work. Thus almost half goes to pay the salaries and benefits of the Department of Defense's military and civilian employees.

- Defense Expenditures (Industry) — $445.4 billion is spent on defense purchases from industry.

- Power Plants -- $91.2 billion is spent on the construction of new electric power plants. The remaining $354.2 billion is used to purchase their output.

- Aircraft — $91.2 billion is spent on the construction of new aircraft. The remaining $354.2 billion is used to purchase air transportation services.

- Hospitals — $91.2 billion is spent on the construction of new hospitals. The remaining $354.2 billion is used to purchase services from those hospitals.

- Public Service Employment — $445.4 billion is spent on public service employment (i.e. CETA, WPA, PEP), with 90 percent of the funds earmarked for wages.

Appendix A-8 describes the methodologies used to determine the total employment impacts for each of these sectors.

EXHIBIT IV-4:

COMPARISON OF TOTAL EMPLOYMENT SUPPORTED BY THE METHANOL INDUSTRY WITH TOTAL EMPLOYMENT SUPPORTED BY OTHER SECTORS, SPENDING CONSTANT 1985-2020

	Job-Years of Total Employment 1985-2020	Job-Years of Total Employment Per Billion Dollars Expended 1985-2020
Methanol Industry	13,218,460	29,676
Defense Expenditures (General)[1]	12,372,952	27,778
Defense Expenditures (Industry)[1]	10,393,048	23,333
Power Plants[2]	11,332,704	25,443
Aircraft[3]	12,831,734	28,808
Hospitals[2]	25,679,658	57,652
Public Service Employment[4]	33,507,984	75,227
Total Expenditure (1985-2020) In Each Sector (1981 dollars)	$445,422,700,000	

[1] Congressional Budget Office, Defense Spending and the Economy, February 1983.

[2] Developed from unpublished BLS data and data in Table 5.2 of Regional Cycles and Employment of Public Works Investments by Georges Vernez et.al., The Rand Corporation, January 1977 (Prepared for the Economic Development Administration).

[3] Developed from unpublished BLS data.

[4] Vernez, Georges and Roger Vaughn. Assessment of Countercyclical Public Works and Public Service Employment Programs. The Rand Corporation, September 1978 (Prepared for the Economic Development Administration); and the Congressional Budget Office, Temporary Measures to Stimulate Employment: An Evaluation of Some Alternatives, September 2, 1975.

As shown in Exhibit IV-4, methanol-related employment over the period from 1985 through 2020 is greater than the level of employment supported by an identical total expenditure in the two defense sectors, the power plant sector, and the aircraft sector. In particular, methanol-related employment is estimated to be about 25 percent greater than employment associated with defense purchases from industry. However, total methanol-related employment from 1985 through 2020 is estimated to be much less than total employment in the hospital and public service employment sectors for an identical level of expenditure. This is probably because hospital and public service employment is not capital intensive and also because public service employment generally involves jobs with relatively low salaries.

Although total methanol-supported employment from 1985 through 2020 is greater than that supported by identical expenditures in the two defense sectors, the aircraft sector, and the power plant sector, it does not differ greatly from total employment in three of these four sectors. In fact, it is difficult to conclude from these results that a fuel methanol industry will support more total employment than any of these sectors, with the exception of defense purchases from industry, given differences in the assumptions, the methodologies, and the models used to generate the projections on which these estimates are based. In conclusion, it appears that the job creation potential of a domestic fuel methanol industry is somewhat greater than that of programs involving only purchases of defense-related products, similar to that of other industrial projects, and less than the job creation potential of public service employment programs which pay much lower salaries and are less capital intensive.

E. THE METHANOL INDUSTRY, GASOLINE, AND IMPORTED OIL

If methanol fuel is produced in the United States for transportation uses, it is reasonable to conclude that domestic consumption of gasoline, and thus oil, would decline. In fact, the domestic production of 500,000 barrels per day of methanol could displace as much as 300,000 barrels per day of gasoline refined from imported oil. Thus, the 2.5 million BPD domestic methanol industry could displace 1.5 million BPD of gasoline refined from imported oil, and would supply about 20 percent of the total projected 1995 highway fuel consumption.

Exhibit IV-5 compares the annual capital expenditures (in 1981 dollars) associated with the construction of a 30-plant domestic methanol industry with the value of the gasoline displaced by methanol production. The present discounted value of these

EXHIBIT IV-5:

COMPARISON OF CONSTRUCTION EXPENDITURES WITH DOLLAR VALUES OF DISPLACED GASOLINE REFINED FROM IMPORTED OIL

(Billions of Dollars) 1985 - 1995

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	Total
Annual Construction Expenditures												
1) 1981 Dollars[1]	3.83	8.39	11.49	15.50	18.24	14.41	9.85	6.75	2.74	0	0	91.20
2) Discounted to 1984[2]	3.48	6.93	8.63	10.59	11.33	8.13	5.05	3.15	1.16	0	0	58.45
Annual Dollar Value of Reduced Oil Imports												
1) 1981 Dollars[3]	0	0	0	0	0	4.38	8.76	13.14	17.52	21.90	21.90	87.60
2) Discounted to 1984[1]	0	0	0	0	0	2.47	4.50	6.13	7.43	8.44	7.68	36.65

[1] Assumes plant cost in 1981 dollars = $3 billion, per Dames and Moore.

[2] Assumes a discount rate of 10 percent.

[3] Assumes $40 is the price per imported barrel of gasoline.

capital investments totals $58.45 billion (1981 dollars) for the period from 1985 to 1995. The present discounted value of the displaced gasoline refined from imported oil is $36.65 billion for the same period, conservatively assuming a price of $40 (1981 dollars) per barrel of gasoline. It must be emphasized, however, that the methanol plants will continue to produce fuel after 1995 while the construction expenditures will end in 1993. As shown in Exhibit IV-6, the present discounted value of the displaced gasoline refined from imported oil exceeds the present discounted value of the capital investment by the year 2000, only 6 years after completion of the final set of methanol plants. After that year, the net difference between them grows, reaching nearly $50 billion by 2020.

EXHIBIT IV-6:

COMPARISON OF DISCOUNTED TOTAL CONSTRUCTION EXPENDITURES WITH DISCOUNTED TOTAL VALUE OF DISPLACED OIL IMPORTS (Billions of 1981 Dollars) FOR KEY PERIODS[1]

Period	Discounted Construction Expenditures	Discounted Value of Displaced Oil Imports
Through:		
1995	58.45	36.65
2000	58.45	65.75
2005	58.45	83.82
2010	58.45	95.04
2015	58.45	102.01
2020	58.45	106.34

[1] Expressed in 1981 dollars discounted to 1984 from forecast year.

APPENDIX A-1:
COAL-TO-METHANOL PLANT DESIGN AND FEASIBILITY STUDIES

Project Sponsor	Process Input	Process Output
Dames and Moore/The Nokota Company	Lignite	Methanol
W.R. Grace & Company	Axial basin coal	Methanol
Texas Eastern Synfuels, Inc.	New Mexico coal	SNG Methanol Creosote Naphtha Ammonia
Placer Amex, Inc.	Sub-bituminous coal	Methanol
Westinghouse Synthetic Fuels Division (Keystone)	Pennsylvania bituminous coal	Methanol
EG & G Synfuels, Inc.	Bituminous coal	Methanol
Crow Tribe/Council of Energy Resources Tribes	Montana coal	SNG Naphtha Ammonia Creosote
Central Maine Power Company	Bituminous coal	Synthetic gas
Philadelphia Gas Works	East bituminous coal	290 Btu/scf fuel gas
Celanese Chemical Co., Inc.	Lignite	Methanol Electricity
Celanese Chemical Co., Inc.	Texas lignite	Methanol
General Refractories Company, Inc.	West Kentucky coal	Synthetic gas
TRANSCO Energy Company	Texas lignite	Synthetic gas
Union Carbide Corp.	Illinois bituminous coal	Synthetic gas
Florida Power Corporation	Mid-West coal	Synthetic gas
Clark Oil & Refining Company	Illinois No. 6 coal	Unleaded gasoline
The River Plant/Houston Natural Gas Corporation/Texaco	High Sulfur Illinois No. 6	Methanol Raw gas
Hampshire Energy	Sub-bituminous coal	Gasoline LPG Isobutane Ammonia CO_2
Arkansas Power & Light	Arkansas & Illinois No. 6 coal	Medium Btu gas

APPENDIX A-2:
DEVELOPMENT OF A SIX YEAR PLANT CONSTRUCTION SCENARIO

The Dames and Moore feasibility study was based on a construction period of seven years. For purposes of the current study, the schedule was compressed to six years by spreading the small first year effort anticipated by Dames and Moore over the three subsequent years of construction. Relationships between the Dames and Moore schedule and that of the current study are described below.

The Dames and Moore study provided the construction employment schedule shown:[1]

Year	Employment	Percentage of Total Employment	
		Yearly %	Cumulative %
1985	557	3.3%	3.3%
1986	3186	18.9%	22.2%
1987	4012	23.8%	46.0%
1988	2692	16.0%	62.0%
1989	3643	21.6%	83.6%
1990	2629	15.6%	99.2%
1991	137	.8%	100.0%
		100.0%	100.0%

This schedule served as the foundation for the direct construction employment schedule and for the development of the annual construction bill of goods for the current study.

After compressing the Dames and Moore schedule, the following employment schedule was developed for the current study:

Year	Employment[2]	Percentage of Total Employment	
		Yearly %	Cumulative %
1	3500	20.7%	20.7%
2	4200	24.8%	45.5%
3	2800	16.5%	62.0%
4	3700	21.8%	83.8%
5	2600	15.3%	99.1%
6	150	.9%	100.0%
		100.0%	100.0%

[1] Dames and Moore/The Nokota Company, Dunn-Nokota Methanol Project, Dunn County, North Dakota. Prepared for U.S. Department of Energy, 1983, Vol. VII, p.5-75.

[2] Due to rounding, the current analysis assumes a slightly greater number of employees than the Dames and Moore study (16,950 per plant compared to 16,856).

The materials and services requirements schedule assumes that materials and services are demanded in approximately the same proportion each year as labor. The following schedule of construction materials and services requirements (for each plant) was used in the analysis:

Construction Materials and Services Requirements

Year	Percentage of Total Requirements, Per Plant	
	Yearly %	Cumulative %
1	21%	21%
2	25%	46%
3	17%	63%
4	22%	85%
5	15%	100%
6	0%	100%

APPENDIX A-3:
BUREAU OF LABOR STATISTICS INPUT-OUTPUT SECTORING PLAN

APPENDIX A-3

Bureau of Labor Statistics Input-Output Sectoring Plan

	Industry sector number and title	Bureau of Economic Analysis Input-Output Sector	Standard Industrial Classification (SIC) 1972
	Agriculture, forestry, and fisheries		
1	Dairy and poultry products	1.01-1.02	pt. 01, pt. 02
2	Meat animals and livestock	1.03	pt. 01, pt. 02
3	Cotton	2.01	pt. 01, pt. 02
4	Food and feed grains	2.02	pt. 01, pt. 02
5	Agricultural products, n.e.c	2.03-2.07	pt. 01, pt. 02
6	Forestry and fishery products	3.00	08 (except 085), 091, 0971
7	Agricultural, forestry, and fishery services	4.00	071, 072, 075, 076, 078, 085, 092
	Mining		
8	Iron and ferroalloy ores mining	5.00	101, 106
9	Copper ore mining	6.01	102
10	Nonferrous metal ores mining, except copper	6.02	10 (except 101, 102, 106, pt. 108, 109)
11	Coal mining	7.00	11, 12
12	Crude petroleum and natural gas	8.00	13 (except pt. 138)
13	Stone and clay mining and quarrying	9.00	14 (except 147, pt. 148)
14	Chemical and fertilizer mineral mining	10.00	147
	Maintenance and repair construction		
15	Maintenance and repair construction	12.01-12.02	pt. 15, pt. 16, pt. 17, pt. 138
	Manufacturing		
16	Ordnance	13.02-13.07	348, 3795
17	Complete guided missiles and space vehicles	13.01	3761
18	Meat products	14.01	201
19	Dairy products	14.02-14.06	202
20	Canned and frozen foods	14.07-14.13	203, 2091-2092
21	Grain mill products	14.14-14.17	204
22	Bakery products	14.18	205
23	Sugar	14.19	2061-2063
24	Confectionery products	14.20	2065-2067
25	Alcoholic beverages	14.21	208 (except 2086-2087)
26	Soft drinks and flavorings	14.22-14.23	2086-2087
27	Food products, n.e.c	14.24-14.32	207, 209 (except 2091-2092)
28	Tobacco manufacturing	15.01-15.02	21
29	Fabric, yarn, and thread mills	16.01-16.04	221-224, 226, 228
30	Floor covering mills	17.01	227
31	Textile mill products, n.e.c	17.02-17.10	229

	Industry sector number and title	Bureau of Economic Analysis Input-Output Sector	Standard Industrial Classification (SIC) 1972
32	Hosiery and knit goods	18.01-18.03	225
33	Apparel	18.04	23 (except 239), 39996
34	Fabricated textile products, n.e.c	19.01-19.03	239
35	Logging	20.01	241
36	Sawmills and planing mills	20.02-20.04	242
37	Millwork, plywood and wood products, n.e.c.	20.05-20.09	243, 2448, 245 (except 2451), 249
38	Wooden containers	21.00	244 (except 2448)
39	Household Furniture	22.01-22.04	251
40	Furniture and fixtures, except household	23.01-23.07	25 (except 251)
41	Paper products	24.01-24.07	26 (except 265)
42	Paperboard	25.00	265
43	Newspaper printing and publishing	26.01	271
44	Periodical and book printing, publishing	26.02-26.04	272-274
45	Printing and publishing, n.e.c	26.05-26.08	275-279
46	Industrial inorganic and organic chemicals	27.01	281 (except 28195), 2865, 2869
47	Agricultural chemicals	27.02-27.03	287
48	Chemical products, n.e.c	27.04	2861, 289
49	Plastic materials and synthetic rubber	28.01-28.02	2821-2822
50	Synthetic fibers	28.03-28.04	2823-2824
51	Drugs	29.01	283
52	Cleaning and toilet preparations	29.02-29.03	284
53	Paints and allied products	30.00	285
54	Petroleum refining and related products	31.01-31.03	29
55	Tires and inner tubes	32.01	301
56	Rubber products except tires and tubes	32.02-32.03, 32.05	302-306
57	Plastic products	32.04	307
58	Leather tanning and industrial leather	33.00	311
59	Leather products including footwear	34.01-34.03	31 (except 311)
60	Glass	35.01-35.02	321-323
61	Cement and concrete products	36.01, 36.10-36.14	324, 327
62	Structural clay products	36.02-36.05	325
63	Pottery and related products	36.06-36.09	326
64	Stone and clay products, n.e.c	36.15-36.22	328, 329
65	Blast furnaces and basic steel products	37.01	331
66	Iron and steel foundries and forgings	37.02-37.04	332, 339, 3462
67	Primary copper and copper products	38.01, 38.07, 38.10, 38.12	3331, 3351, 3357, 3362
68	Primary aluminum and aluminum products	38.04, 38.08, 38.11	3334, 28195, 3353-55, 3361
69	Primary nonferrous metals and products, n.e.c	38.02, 38.03, 38.05, 38.06, 38.09, 38.13, 38.14	3332, 3333, 3339, 334, 3356, 3369, 3463
70	Metal containers	39.01-39.02	341
71	Heating apparatus and plumbing fixtures	40.01-40.03	343

	Industry sector number and title	Bureau of Economic Analysis Input-Output Sector	Standard Industrial Classification (SIC) 1972
72	Fabricated structural metal products	40.04-40.09	344
73	Screw machine products	41.01	345
74	Metal stampings	41.02	346 (except 3462-3463)
75	Cutlery, handtools and general hardware	42.01-42.03	342
76	Fabricated metal products, n.e.c	42.04-42.11	347, 349
77	Engines, turbines, and generators	43.01-43.02	351
78	Farm machinery	44.00	352
79	Construction, mining and oilfield machinery	45.01-45.03	3531-3533
80	Material handling equipment	46.01-46.04	353 (except 3531-3533)
81	Metalworking machinery	47.01-47.04	354
82	Special industry machinery	48.01-48.06	355
83	General industrial machinery	49.01-49.07	356
84	Nonelectrical machinery, n.e.c	50.00	359
85	Computers and peripheral equipment	51.01	3573-3574
86	Typewriters and other office equipment	51.02-51.04	357 (except 3573 and 3574)
87	Service industry machines	52.01-52.05	358
88	Electric transmission equipment	53.01-53.03	361, 3825
89	Electrical industrial apparatus	53.04-53.08	362
90	Household appliances	54.01-54.07	363
91	Electric lighting and wiring	55.01-55.03	364
92	Radio and television receiving sets	56.01-56.02	365
93	Telephone and telegraph apparatus	56.03	3661
94	Radio and communication equipment	56.04	3662
95	Electronic components	57.01-57.03	367
96	Electrical machinery and equipment, n.e.c	58.01-58.05	369
97	Motor vehicles	59.01-59.03	371
98	Aircraft	60.01-60.04	372, 376 (except 3761)
99	Ship and boat building and repair	61.01-61.02	373
100	Railroad equipment	61.03	374
101	Motorcycles, bicycles and parts	61.05	375
102	Transportation equipment, n.e.c	61.06-61.07	379 (except 3795), 2451
103	Scientific and controlling instruments	62.01-62.03	381, 382 (except 3825)
104	Medical and dental instruments	62.04-62.06	384
105	Optical and ophthalmic equipment	63.01-63.02	383, 385
106	Photographic equipment and supplies	63.03	386
107	Watches, clocks, and clock-operated devices	62.07	387
108	Jewelry and silverware	64.01	391, 3961
109	Musical instruments and sporting goods	64.02-64.04	393, 394
110	Manufactured products, n.e.c	64.05-64.12	395, 396 (except 3961), 399 (except 39996)
	Transportation		
111	Railroad transportation	65.01	40, 474, pt. 4789
112	Local transit and intercity buses	65.02	41
113	Truck transportation	65.03	42, pt. 4789
114	Water transportation	65.04	44

Industry sector number and title	Bureau of Economic Analysis Input-Output Sector	Standard Industrial Classification (SIC) 1972
Transportation, contd.		
115 Air transportation	65.05	45
116 Pipeline transportation	65.06	46
117 Transportation services	65.07	47 (except 474 and pt. 4789)
Communications		
118 Radio and television broadcasting	67.00	483
119 Communications, except radio and television	66.00	48 (except 483)
Electric, gas, and sanitary services		
120 Electric utilities, public and private	68.01, 78.02, 79.02	491, pt. 493
121 Gas utilities, excluding public	68.02	492, pt. 493
122 Water and sanitary services, excluding public	68.03	49 (except 491, 492 and pt. 493)
Trade		
123 Wholesale trade	69.01	50, 51
124 Eating and drinking places	74.00	58
125 Retail trade, except eating and drinking places	69.02	52-57, 59, 7396, pt. 8042
Finance, Insurance, and Real Estate		
126 Banking	70.01	60
127 Credit agencies and financial brokers	70.02-70.03	61, 62, 67
128 Insurance	70.04-70.05	63, 64
129 Owner occupied real estate	71.01	na
130 Real estate	71.02	65 , 66, pt. 1531
Other services		
131 Hotels and lodging places	72.01, 77.08	70, 836
132 Personal and repair services	72.02	72 (except 723, 724), 76 (except 7692, 7694 and pt. 7699)
133 Barber and beauty shops	72.03	723, 724
134 Business services, n.e.c	73.01	73 (except 731, 7396), 7692, 7694, pt. 7699
135 Advertising	73.02	731
136 Professional services, n.e.c	73.03	81, 89 (except 8922)
137 Automobile repair	75.00	75
138 Motion pictures	76.01	78
139 Amusements and recreation services	76.02	79
140 Doctors' and dentists' services	77.01	801-803, 8041
141 Hospitals	77.02	806
142 Medical services, except hospitals	77.03	074, 8049, 805, 807-809
143 Educational services	77.04, 77.06-77.07	82, 833, 835
144 Nonprofit organizations	77.05, 77.09	832, 839, 84, 86, 8922

	Industry sector number and title	Bureau of Economic Analysis Input-Output Sector	Standard Industrial Classification (SIC) 1972
	Government enterprises		
145	Post office	78.01	43
146	Commodity credit corporation	78.03	na
147	Federal enterprises, n.e.c	78.04	na
148	Local government passenger transit	79.01	na
149	State and local government enterprises, n.e.c	79.03	na
	Special industries		
150	Noncomparable imports	80.00	na
151	Scrap, used and secondhand goods	81.00	na
152	Construction industry	na	na
153	Government industry	82.00	na
154	Rest of the world industry	83.00	na
155	Households	84.00	na
156	Inventory valuation adjustment	85.00	na

Office of Economic Growth,
U.S. Bureau of Labor statistics.
October 18, 1979

(THIS SUPERCEDES PREVIOUS 162 ORDER SECTORING PLAN)

APPENDIX A-4:
DEVELOPMENT OF GOODS AND SERVICES INPUT DATA FOR PLANT CONSTRUCTION, START-UP, AND OPERATION, IN BLS SECTOR DETAIL

The development of goods and services input data (i.e., bills of goods) for plant construction, start-up, and operation in BLS sector detail involved the following operations:

1) Determine whether an input listed by Dames and Moore could be assigned directly to a single BLS sector.

2) If not, collect and apply additional information that enables disaggregation of the input.

3) Assign BLS codes to all disaggregated inputs.

4) Within each cost category (i.e., construction, start-up, and operating), develop input totals by BLS sector.

Each of these steps in discussed in further detail below.

A. DETERMINING WHETHER RAW INPUT DATA REQUIRED DISAGGREGATION

The Dames and Moore study provided materials and services costs separately for plant construction, start-up, and operation. Within each of the three categories, the study provided detail on the specific goods purchased. Some goods and services could be assigned a BLS sector code without further analysis. Examples of these include a detailed list of chemical and catalyst inputs to start-up and operation, and inputs of concrete, structural steel, piping, paint, and insulation to plant construction. Other goods and services listed in the report required further analysis to divide them into their component BLS sectors. Development of data on the latter category of goods and services is described below.

B. DISAGGREGATING INPUT DATA

When data provided in the Dames and Moore study was not as detailed as that needed for the current analysis, it was disaggregated using:

1) information made available by the Fluor Corporation, which performed the plane design study and cost estimation for Dames and Moore, and

2) data available through economic and business publications, and developed through discussions with trade association personnel.

Documentation of this step of the data development for individual inputs is provided in the following paragraphs.

1. Plant By-Pass Roads, Water Supply Systems, Railroads, Electric Transmission Lines, and Buildings

The disaggregation to the BLS sector level of five Dames and Moore inputs to the construction of a coal-to-methanol plant was accomplished using 1972 Bureau of Economic Analysis (BEA) input-output data published in The Detailed Input-Output Structure of the U.S. Economy: 1972.[1] These five inputs were plant by-pass roads, water supply systems, railroads, electric transmission lines, and buildings.

The disaggregation was performed as follows:

1) Identify the BEA construction industry sector containing the Dames and Moore input.

2) Convert all BEA input codes to that BEA constrution sector into BLS input codes using the concordance in Appendix A-3.

3) Use BEA's Detailed Input-Output Structure to identify the resultant ten BLS sectors with the largest inputs to that construction industry.

[1] Bureau of Economic Analysis, U.S. Department of Commerce, The Detailed Input-Output Structure of the U.S. Economy: 1972, Volume 1, 1979.

4) Use weighted averages to assign the total input cost provided by Dames and Moore to each BLS sector.

In all cases, the ten BLS sectors with the largest inputs amounted to more than 83 percent of total inputs of goods and services to the relevant construction industry. Thus, this methodology omits demand for goods and services from some sectors, while somewhat overstating demand for others.

A list of the five BEA construction industry sectors containing these five inputs, to which this methodology was applied to disaggregate the inputs into ten BLS sectors, follows below.

Dames and Moore Inputs	BEA Construction Sector	BEA Sector Number
Plant by-pass roads	New highways and streets	11.04
Water supply systems	New water supply facilities	11.0306
Railroads	New railroads	11.0302
Electric Transmission Lines	New electric utility facilities	11.0303
Buildings	New industrial buildings	11.0201

2. Construction Services, Supplies, and Expenses and Field Staff Subsistence and Expenses

Details on the contents of these two categories of inputs were made available by Fluor Corporation. According to a Fluor spokesman, approximately $70 million of the $89 million cost of construction services, supplies, and expenses (1981 dollars, purchaser's prices) is spent on welding rod and oxygen; and the remaining cost is for equipment maintenance. This analysis assigned $35 million to welding rod and $35 million to oxygen. Welding rod, oxygen, and equipmen tmaintenance costs were then coded to BLS sectors.

A similar procedure was used for field staff subsistence and expenses. The Fluor spokesman confirmed that the $14 million per plant cost associated with this input was expended in hotels and restaurants, and on car rental (1981 dollars, purchaser's prices). These sectors were each assigned 55 percent, 15 percent, and 30 percent of the input cost, respectively.

3. Warehouse Spare Parts and Maintenance Materials

The Dames and Moore study estimated a pre-operational cost of $61 million per plant for warehouse spare parts and an operating cost estimate of $29 million for maintenance materials (1981 dollars, purchaser's price). In the absence of further information these costs were divided among BLS manufacturing sectors in proportion to the contribution of each sector to the construction cost of the plant. Two sectors accounted for 62 percent of the cost: General Industrial Machinery (50.3 percent) and Fabricated Metal Products, nec. (11.6 percent). A list of BLS sectors and the proportions of the costs of spare parts and maintenance materials assigned to each is shown in Exhibit A-4a.

4. Other Inputs

A few inputs were assigned BLS sectors without further data development after consultation with Fluor Corporation or a trade association confirmed that all or most of the cost could be assigned to a particular BLS category. Examples of inputs in this category, and the BLS sector to which they were assigned, follow.

Input	BLS Sector
Temporary Construction Buildings	72
Excavation	13
Machinery and Equipment	83
Instruments	103
Mobile Equipment	80

C. ASSIGNING BLS CODES TO DISAGGREGATED INPUTS AND DEVELOPING TOTALS BY SECTOR

Having disaggregated the inputs to BLS sector level detail, each input was then coded to a BLS sector. The final step in the data development was then to develop input totals by BLS sector for construction, start-up, and operation. The product was a list of inputs for each of the three phases of industry development, by BLS sector, in 1981 dollars and purchasers prices.

EXHIBIT A-4a:

PROPORTION OF COSTS OF

WAREHOUSE SPARE PARTS AND MAINTENANCE

MATERIALS ASSIGNED TO EACH BLS SECTOR

BLS Sector	Percent of Total
83	50.3%
76	11.6%
103	5.9%
61	5.3%
91	4.6%
72	4.4%
46	4.2%
65	3.6%
69	2.8%
80	1.8%
64	1.5%
88	1.5%
66	1.1%
75	0.7%
40	0.4%
53	0.3%

APPENDIX A-5:
DEVELOPMENT OF INPUT DATA IN PRODUCERS' PRICES

The interindustry activity model within the Bureau of Labor Statistics' Economic Growth Model System is an input-output model that lists the flows of goods and services among industry sectors, and to final demand. When coupled with the BLS labor demand model, the interindustry model can be used to translate changes in demand into changes in employment. These changes in demand, however, must be expressed in producers' prices, since the flows in the model are in producers' prices.

The plant cost data in the Dames and Moore report are given in purchasers' prices. The difference between BLS producers' prices and the Dames and Moore prices is made up of three components:

- transportation margins,
- wholesale trade margins, and
- state and local excise taxes

These components must be subtracted from the Dames and Moore purchasers' prices to yield the producers' prices required by the BLS model. Discussion of the development of data on each component follows.

A. TRANSPORTATION MARGINS

The development of the transportation margins was a two-step process, as follows:

1) identify the total transportation margin associated with each input; and

2) assign portions of the total transportation margin to individual transportation sectors (e.g.; truck, rail, air, etc.).

The source of data for both steps was Jack Faucett Associates' Multi-Regional Input-Output (MRIO) model of the U.S. economy.[1] This model, which identifies flows

[1] Jack Faucett Associates. The Multiregional Input-Output Accounts, 1977. U.S. Department of Health and Human Services, July 1983.

of goods and services in purchasers' prices, contains data on the transportation margin included in purchasers' prices, by economic sector.

The changing of purchasers' prices into producers' prices began by first coding all inputs to an MRIO sector. For each MRIO sector identified, the ratio between the MRIO's transportation margin and total production (in purchasers' prices) for that sector was calculated. This was then multiplied by the Dames and Moore purchasers' price for that input to yield the transportation margin for that input. This method was employed to calculate the total transportation margin for all sectors in either the construction or operation bills of goods.

MRIO data on the amount of the transportion margin accounted for by each transportation industry was then used to assign the margins to individual sectors. The ratio between each transportion industry's share and the total transportation margin, as listed in the MRIO by sector, was applied to the transportation margin calculated for each input. The total transportion margin for each sector was thus assigned to each of the following transportation industries:

- rail,
- for hire trucks,
- water,
- air transportation, and
- pipeline.

Costs within each of the five transportation industries were coded to BLS sectors and summed. The result was a list of the total inputs of transportation from five transportation industries for plant construction, start-up, and operation.

B. WHOLESALE TRADE MARGINS

The development of data on wholesale trade margins was accomplished using the same methodology as for transportion margins. The source of data was Jack Faucett Associates' Multi-Regional Input-Output model. First, all inputs to plant construction, start-up, and operation were coded to MRIO sectors. The ratio between the MRIO wholesale margin and total production for each sector (in purchasers' prices) was then calculated and applied to the purchasers' price of the input to plant construction or

operation for that sector. The product was a list of wholesale trade margins by sector, which were summed to produce separate wholesale trade margins for plant construction, start-up, and operation.

C. STATE AND LOCAL EXCISE TAXES

Like the transportation and wholesale trade margin data, the source of information on state and local excise taxes was Jack Faucett Associates' Multi-Regional Input-Output model. Data and documentation in the MRIO were used to identify the coal-to-methanol plant input sectors subject to state and local excise taxes. Only one such sector was identified: BLS sector 120, Electric Utilities (MRIO Sector 094). State and local excise taxes of $2,480.9 million were associated with the electric utility industry's total production of $66,242 million. The ratio between these two was calculated (0.0375) and applied to inputs from the electric utility industry. The resulting amounts ($105,000 for plant start-up and $185,000 per year for operation) are treated as wholesale margins.

D. SUBTRACTION OF MARGINS FROM THE PURCHASERS' PRICES FOR INPUTS

The final step in the adjustment of the Dames and Moore input data from purchasers' prices to producers' prices was to subtract the transportation margins and wholesale margins (including state and local excise taxes) from the purchasers' prices for each input. The remainder was the producers' price of the input. Transportation and wholesale margins were then summed for construction, start-up, and operation. These totals were also included in the list of construction, operation, or start-up inputs to the plant, since employment is also associated with these sectors.

APPENDIX A-6:
DEFLATION OF PRODUCERS' PRICES FROM 1981 TO 1972 DOLLARS

The BLS industry activity model is based on 1972 values for goods and services. The cost data in the Dames and Moore report are in 1981 dollars. BLS provided deflators for adjusting the 1981 dollars to 1972 dollars. A list of these deflators is attached.

APPENDIX A-6: (Continued)

DEFLATORS FOR CHANGING 1981 PRODUCER PRICES TO 1972 PRODUCER PRICES BY BLS SECTOR

BLS Sector	Deflation Adjustment Factor	BLS Sector	Deflation Adjustment Factor	BLS Sector	Deflation Adjustment Factor
010	3.845	072	2.391	124	2.123
013	1.687	075	2.142	125	1.739
037	1.887	076	2.136	131	2.360
040	2.149	080	2.223	134	1.912
046	3.648	083	2.353	136	1.860
047	3.193	089	1.914	137	2.176
048	2.434	091	2.150		
049	3.026	103	1.935		
053	1.790	111	2.091		
054	6.829	113	2.129		
061	2.238	114	2.190		
064	2.790	115	2.153		
065	2.808	116	4.445		
066	2.517	120	2.519		
067	1.794	122	2.117		
069	3.056	123	1.957		

APPENDIX A-7:
DEVELOPMENT OF DATA ON INPUTS OF COAL TO PLANT OPERATION

Each coal-to-methanol plant is assumed to consume 25,000 tons of coal per day to produce 85,000 barrels per day of methanol. In addition, each plant is assumed to stockpile coal for four years prior to commencing operation. Thus, stockpiling begins in the second year of construction at 20 percent of the annual operating consumption, and increases each year according to the schedule below:

Demand for Coal

Year[1]	Percentage of Full Operating Demand
1	0%
2	20%
3	40%
4	60%
5	80%
Remaining Years to 1995	100%

The resultant annual coal demand, in tons, is listed in Exhibit A-7a.

The development of cost data on the demand for coal is necessary so that the BLS interindustry model and the BLS labor demand model can be used to estimate the level of employment required to deliver the coal demanded in each year from 1986 through 1995. The development of this cost data proceeded as follows. First, the 1972 price of coal was determined to be $8.44 per ton (purchasers' price).[2] Jack Faucett Associates Multi-Regional Input-Output model was then used to estimate transportation and wholesale trade margins. In the MRIO, 1.72 percent of the purchasers' price of coal is accounted for by wholesale margins and 7.5 percent by transportation margins as follows:

[1]The year "1" is the first year of plant construction. Year 6 is the first year of plant operation.

[2]U.S. Department of Energy, Energy Information Administration, Coal Data: A Reference, October 1982, p. 56.

Transportation Margins

Mode	Percent of Purchasers' Price
For-Hire Truck	2.07%
Rail	4.83%
Water	.60%

These proportions were applied to the purchasers' price per ton of coal, yielding the following:

Summary of Purchasers' and Producers' Prices for Coal

Purchasers' Price:	$8.44/ton
Less:	
Wholesale Margin:	(.146/ton)
For-Hire Truck Margin:	(.175/ton)
Railroad Margin:	(.408/ton)
Water Margin:	(.051/ton)
Producers' Price:	$7.66/ton

The producers' price of coal, per ton, and the inputs per ton for the margin sectors were multiplied by the schedule of demand for coal shown in Exhibit A-7a. The resulting bill of goods for coal is shown in Exhibit A-7b. It is this bill of goods that is used to estimate coal-related employment.

EXHIBIT A-7a:

TONS OF COAL CONSUMED PER YEAR

1986-1995

(Millions of Tons)

YEAR / PLANTS	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Plants 1-6	10.95	21.90	32.85	43.80	54.75	54.75	54.75	54.75	54.75	54.75
Plants 7-12		10.95	21.90	32.85	43.80	54.75	54.75	54.75	54.75	54.75
Plants 13-18			10.95	21.90	32.85	43.80	54.75	54.75	54.75	54.75
Plants 19-24				10.95	21.90	32.85	43.80	54.75	54.75	54.75
Plants 25-30					10.95	21.90	32.85	43.80	54.75	54.75
Total	10.95	32.85	65.70	109.50	164.25	208.05	240.90	262.80	273.75	273.75

EXHIBIT A-7b:
BILL OF GOODS, FOR COAL, BY BLS SECTOR
1986-1995
(thousands of 1972 dollars, producers' prices)

BLS SECTOR \ YEAR	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	83877.0	251669.0	503262.0	838770.0	1258155.0	1593633.0	1845294.0	2013048.0	2096925.0	2096925.0
12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
42	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
43	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
44	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
47	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
48	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
49	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

EXHIBIT A-7b:
BILL OF GOODS, FOR COAL, BY BLS SECTOR
1986-1995
(Continued)

BLS SECTOR \ YEAR	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
51	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
53	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
54	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
56	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
57	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
58	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
59	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
61	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
62	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
63	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
64	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
66	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
67	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
68	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
69	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
72	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
73	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
74	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
75	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
76	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
77	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
78	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
79	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
82	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
83	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
84	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
85	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
86	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
87	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
88	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
89	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
90	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
91	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
93	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
94	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
95	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
96	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
97	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
98	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

EXHIBIT A-7b:
BILL OF GOODS, FOR COAL, BY BLS SECTOR
1986-1995
(Continued)

BLS SECTOR \ YEAR	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
99	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
101	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
102	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
103	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
104	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
105	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
106	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
107	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
108	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
109	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
110	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
111	4468.0	13403.0	26806.0	44676.0	67014.0	84884.0	98287.0	107222.0	111690.0	111690.0
112	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
113	1916.0	5749.0	11498.0	19163.0	28744.0	36409.0	42158.0	45990.0	47906.0	47906.0
114	558.0	1675.0	3351.0	5585.0	8377.0	10611.0	12286.0	13403.0	13961.0	13961.0
115	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
116	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
117	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
118	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
119	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
120	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
121	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
122	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
123	1599.0	4796.0	9592.0	15987.0	23981.0	30375.0	35171.0	38369.0	39968.0	39968.0
124	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
126	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
127	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
128	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
129	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
130	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
131	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
132	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
133	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
134	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
135	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
136	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
137	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
138	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
139	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
140	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
141	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
142	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
143	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
144	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
145	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
146	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
147	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

EXHIBIT A-7b:
BILL OF GOODS, FOR COAL, BY BLS SECTOR
1986–1995
(Continued)

BLS SECTOR \ YEAR	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
148	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
149	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
150	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
151	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
152	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
153	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
154	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
155	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
156	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SUMS	92418.0	277292.0	554509.0	924181.0	1386271.0	1755912.0	2033196.0	2218032.0	2310450.0	2310450.0

APPENDIX A-8:
ESTIMATION OF TOTAL EMPLOYMENT FROM 1985 TO 2020

In order to estimate the total employment supported by the methanol industry and several alternative projects of similar scope, it was first necessary to estimate total expenditures (in 1981 dollars) in the methanol industry between 1985 and 2020. This amount equals the sum of all expenditures on methanol plant construction and operation, including capital investment between 1985 and 1994 ($91.2 billion); start-up and operating costs between 1985 and 1994 ($16.5 billion); the cost of coal between 1986 and 1994 ($41.1 billion); and the annual cost of operating the 30 plants in each year between 1995 and 2020 ($11.4 billion per year).[1] Thus, the total expenditure on the methanol industry is estimated to be $445.4 billion between 1985 and 2020.

Methanol Industry Total Employment

Total employment supported by the methanol industry between 1985 and 2020 equals the estimated total employment through 1995 (4,870,583 jobs) plus projected employment in each year after 1995. Annual methanol-related employment for each year after 1995 is projected to be 99 percent of total employment in the previous year. This employment deflator reflects an estimated 2 percent annual improvement in direct and indirect labor productivity between 1995 and 2020 for the industry, and an estimated 1 percent annual increase in the total employment multiplier associated with direct and indirect methanol-related employment.[2]

Defense Expenditures

Total employment supported by $445.4 billion in defense expenditures between 1985 and 2020 was calculated using employment estimates per $1 billion (1981 dollars) of expenditure reported by the Congressional Budget Office in Defense Spending and the Economy (February 1983). These estimates were 27,778 jobs per billion dollars (1981 dollars) expended on general defense purchases; and 23,333 jobs per billion dollars expended on defense purchases from industry. Total employment supported by these types of expenditures equals the product of each factor and $445.4 billion.

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[1] Dames and Moore/The Nokota Company, Dunn-Nokota Methanol Project. Prepared for U.S. Department of Energy, Volumes I-VIII, 1983.

[2] These rates of change are estimated from the results of this study, and are specific hereto. For other sectors considered in the following sections, it is assumed, conservatively, that changes in productivity proceed at the same rate as changes in the total employment multiplier, effectively keeping annual total employment constant for every $1 billion expended over the period from 1985 through 2020.

Power Plants

Total employment supported by the expenditure of $445.4 billion on power plants consists of employment supported by the expenditure of $91.2 billion on the construction of power plants, and employment supported by the expenditure of $354.2 billion on their output (BLS Sector 120). Construction employment was estimated by multiplying the total labor requirements factor for powerhouse construction in Exhibit IV-3 (19,800 direct and indirect jobs per $1 billion) by 1.5 to include induced employment[1], and then multiplying by $91.2 billion. Operating-related employment was estimated by deflating total expenditures of $354.2 billion (1981 dollars) by 2.519 to obtain expenditures of $140.6 billion (1972 dollars), multiplying by 40,886 (direct and indirect employment per $1 billion (1972 dollars) expended in BLS Sector 120)[2], and multiplying by 1.5 to include induced employment. Summing these employment estimates yields an estimate of total employment between 1985 and 2020.

Aircraft

Employment supported by the expenditure of $445.4 billion on aircraft was divided into employment supported by the expenditure of $91.2 billion on aircraft manufacture (BLS Sector 98), and employment supported by the expenditure of $354.2 billion on air transportation services (BLS Sector 115). Manufacturing-supported employment was calculated by deflating the total expenditure of $91.2 billion to $37.4077 billion (1972 dollars, using the BLS price deflator of 2.438), multiplying by 68,249 (equivalent to the BLS estimate of 68.249 jobs per $1 million (1972 dollars) expended in BLS Sector 98)[3], and multiplying by 1.5 to include induced employment. Total employment supported by the expenditure of $354.2 billion on air transportation services was estimated similarly, using a BLS price deflator of 2.153, and employment factor of 52,892 jobs per $1 billion (1972 dollars)[4] expended, and the adjustment factor of 1.5 to include induced employment. Summing these components yielded total employment.

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[1] A multiplier of 1.5 implies that one induced job is created for every 2 direct and/or indirect jobs supported by the activity. This is a conservative estimate, and it is equivalent to the total employment multiplier for 1985 in the methanol industry analysis. This multiplier was used in several of the sectors discussed in this section as independently-derived multipliers were not available.

[2] U.S. Department of Labor, Bureau of Labor Statistics, unpublished data, 1984.

[3] Ibid.

[4] Ibid.

Hospitals

Employment supported by the expenditure of $445.4 billion on hospitals was divided into employment supported by the expenditure of $91.2 billion on hospital construction, and employment supported by the expenditure of $354.2 billion on hospital services (BLS Sector 141). Employment supported by the construction of hospitals was estimated by inflating the total labor requirements factor for hospital construction (16,700 jobs per $1 billion) in Exhibit IV-3 by 1.5 to include induced employment, and then multiplying by $91.2 billion. Operating-related employment was estimated by deflating 1981 dollar expenditures of $354.2 billion to 1972 dollars ($135.1 billion) using the BLS price deflator of 2.621, multiplying by 115,405 (equivalent to the BLS estimate of 115.405 jobs per $1 million (1972 dollars) expended on final demand in BLS Sector 141)[1], and multiplying by 1.5 to include induced employment. Summing these two components yields total employment supported by the expenditure of $445.4 billion on the construction and operation of hospitals between 1985 and 2020.

Public Service Employment

Employment supported by the expenditure of $445.4 billion on public service employment was estimated using the results of a Congressional Budget Office report.[2] This study concluded that the expenditure of $1 billion (1975 dollars) on public service employment would create 90,000 to 150,000 net jobs. After using the government purchases deflator to translate to 1981 dollars, this result suggests that the expenditure of $1 billion (1981 dollars) on public service employment will ultimately result in an average of 75,227 jobs. Thus, the expenditure of $445.4 billion (1981 dollars) on public service employment between 1985 and 2020 should create approximately 33.5 million jobs.

Comparability of These Estimates

Although every effort was made to develop comparable estimates of the level of total employment supported by the expenditure of $445.4 billion dollars in the above sectors

[1] U.S. Department of Labor, Bureau of Labor Statistics, unpublished data 1984.

[2] Congressional Budget Office, Temporary Measures to Stimulate Employment: An Evaluation of Some Alternatives, September 2, 1975.

between 1985 and 2020, the results should be considered to be order of magnitude values rather than precise estimates. Differences in the assumptions, models, and methodologies underlying the original analyses on which these projections are based, as well as the period of performance of the original studies, make it impossible to assure that these estimates are directly comparable. Consequently, the reader should not draw definitive conclusions from these figures about the employment potential of one project versus another project.