PNL-10760
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SEADS:-PC:
Sectoral Energy/Employment
Analysis and Data System

Methodology, Capabilities, and an Example: Employment Impacts of the Climate Change Action Plan

J. M. Roop
D. M. Anderson
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September 1995

Prepared for
U.S. Department of Energy
under Contract DE-AC06-76RLO 1830

Pacific Northwest Laboratory
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Battelle

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Executive Summary

A software package, Sectoral Energy/Employment Analysis and Data System (SEADS-PC), that can translate policy changes into employment and energy impacts is described. The core data for this tool include input-output (I/O) tables for 1977, 1982, 1987, and 2005 in 1982 dollars, and I/O tables for 1987 and 1990 in 1987 dollars. For each of the I/O tables there are corresponding final demand vectors and employment intensities. For all but the 2005 table there are energy intensities as well. The final demands and the intensities can be changed to reflect alternative policies. A final demand vector that reflects a specific policy, for example, can be created, based on an existing final demand vector. This vector can then be premultiplied by the appropriate I/O table to yield industry output, which in turn can be multiplied by energy or employment intensities to yield employment or energy resulting from the policy scenario. These policy results can then be compared with a base case and the differences reported.

The report is in four sections. The first section is an introduction. The second section provides the accounting framework for the tool and describes the data provided. The third section serves as a user's guide to the software, describing the functionality of the program and what results can be expected. The fourth section uses the President's Climate Change Action Plan (CCAP) as an example policy for which employment impacts can be calculated.

The results of the CCAP exercise suggest that this program will result in about 60,000 new jobs (about 115 million additional hours of work) for the year 2000. In the year 2000, the CCAP final demands are greater than the base case final demands by $192.8 million (1990 dollars). The additional jobs are created as a result of both the shifts among final demand categories and a slight increase in economic activity.

Acronymns

BEA	Bureau of Economic Analysis
BLS	Bureau of Labor Statistics
CCAP	Climate Change Action Plan
DRI	Data Resources, Inc.
EIA	Energy Information Administration
GDP	Gross Domestic Product
I/O	Input-output
MECS	Manufacturing Energy Consumption Survey
OMB	Office of Management and Budget
SEADS	Sectoral Energy/Employment Analysis and Data System
SIC	Standard Industrial Classification

Acknowledgments

This document is a major revision of a program first developed by David B. Belzer in the mid-1980s; his contribution is gratefully acknowledged. The authors would also like to thank our U.S. Department of Energy sponsor, Peggy Podolak, Office of Economic Policy and Competition, (202) 586-6430, without whose support this work would not have been accomplished. Thanks also to Steve Shankle for his suggestions and comments, and to Susan Ennor for her editorial assistance.

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1.0 Introduction

This guide was written by staff of the Pacific Northwest Laboratory[a] for users of the SEADS-PC (Sectoral Energy/Employment Analysis and Data System) for IBM-compatible computers using Windows. SEADS is designed to show the employment and energy implications of changing the industrial structure and patterns of final demands for goods within the U.S. economy.

This version of SEADS-PC is a Windows-based program, written in VisualBasic with extensive documentation provided through help documents. This user's guide provides instructions for preparing various scenarios with the system and walks the user through a typical exercise of running a scenario and preparing tables and spreadsheets. The example used to demonstrate the analytical tool is a comparison of a Climate Change Action Plan scenario with a base case forecast for the year 2000.

SEADS contains core data for analysis for four base years: 1977, 1982, 1987, and 1990. The core data include a vector of final demands, an input-output table, energy intensities, and labor intensities. A set of multipliers that convert national labor and hours data from the national to the state level is also available and can be applied to all core data sets. Input-output, final demand, and employment (i.e., labor intensity) data are also available for the Bureau of Labor Statistics (BLS) forecast year 2005 (BLS 1993). Forecasts of Gross Domestic Product (derived from the U.S. Department of Energy's subscription to Data Resources, Inc. forecasts) between 1995 and 2010 are provided at five-year intervals, with the capability of bridging from these forecasts to a vector of final demands that can generate outputs for analysis. The example analysis is done using both the current (i.e., 1990) industry structure and the industry structure represented by the BLS 2005 input-output table.

This report is organized into three additional sections. The next section provides the accounting framework for the analytical tool and describes the data that constitute the core data set provided with the model. The third section describes the capabilities of SEADS and indicates how the tool can be used to examine a variety of questions that bear on energy policy. The final section demonstrates the analytical power of the tool by applying it to the Climate Change Action Plan.

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2.0 Methodology and Data

2.1 Basic Accounting Structure

The basic input-output (I/O) accounting structure employed in SEADS, along with the employment and energy calculations, are shown in Figure 2.1. The box at the top of the figure is optional. The Data Resources, Inc. (DRI) forecasts (the example is for 1995) are converted through a bridge matrix to a vector of final demands. Alternatively, the user could start with one of the provided final demand vectors. The sum of all final demands is the Gross Domestic Product (GDP). The selected or constructed final demands are pre-multiplied by the total requirements matrix (labeled "Input-Output Table") to yield industry output for each of the 85 industries. This total output for each industry is shown as the box labeled "Industry Output." From a cost perspective total output for each *industry* must equal the cost of purchased commodities plus value added. Value added consists of payments to primary factors — labor compensation, capital or profit-type income, and indirect business taxes. These outputs are not available separately, but are intermediate in the calculation of jobs and hours or energy use.

Employment intensity is shown in the box labeled, "Jobs and Hours Intensities" beneath the output box. These intensities were calculated by dividing jobs or hours for each of the 85 industries by output. Thus these intensities represent the jobs or hours per dollar of output for each of the industries for which output is calculated.

Energy intensity is defined in terms of Btu/per dollar of output, analogous to employment intensities. These intensities are also shown in the figure as an alternative path. Like employment, there is no single intensity for each industry; rather, in SEADS intensities are defined for four fuel types—coal, oil, natural gas, and electricity. Energy use, is computed as the product of output times intensity, on an industry-by-industry basis for each fuel. Similarly, employment (i.e., jobs and hours) is computed as the product of output times employment intensity, on an industry-by-industry basis, and this is shown in the figure. SEADS also provides an option to define a subregion of the United States for which employment (but not energy) impacts can be determined. These regional impacts are calculated by sharing the nation impacts down to the state (or regional) level. This is shown as an option in Figure 2.1.

Figure 2.1 helps to provide some perspective of the relationship between the composition of GDP and employment or energy use in the economy. One of the key capabilities in SEADS is the ability to calculate employment based on an arbitrary set of final demands. By itself, Figure 2.1 does not spell out how this procedure is performed. For this, a more detailed explanation, in terms of the basic matrix algebra underlying the I-O method employed in SEADS, is provided below.

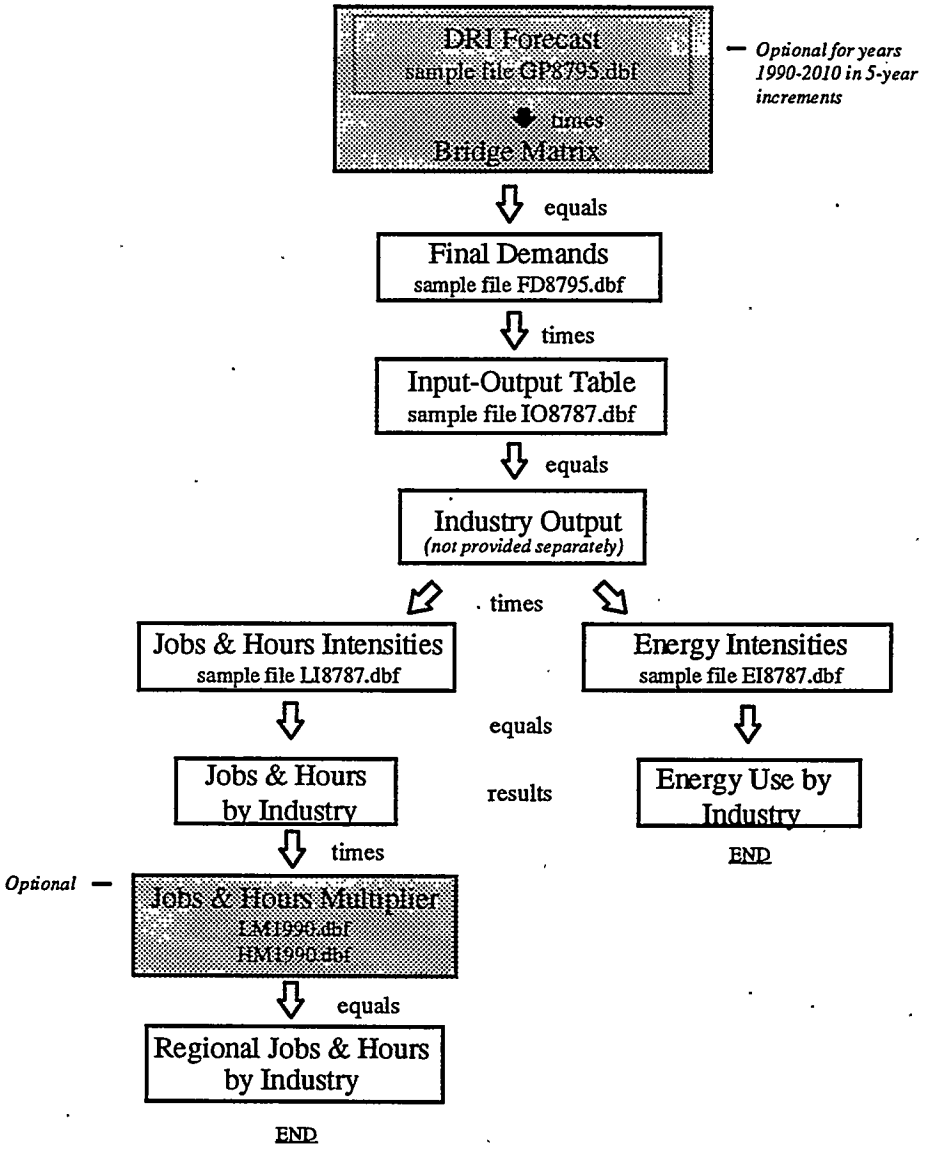

Figure 2.1. The Determination of Employment Using the SEADS-PC Approach

2.2 Final Demand

We begin first with the determination of final demands by commodity. Let F be a column vector of total final demand by commodity. In SEADS we follow the Bureau of Economic Analysis (BEA) convention of reporting 85 commodities and industries, as listed in Section 2.7 (BEA 1991). In terms of Figure 2.1, Final Demands is a 85x1 vector that is the *row* sums of the various components, including personal consumption expenditures, business investment components, and other final demand components. In SEADS a forecast set of GDP components can be converted to this final demand vector and used to generate employment impacts. There are 29 of these final forecast demand categories, as shown in Table 2.1.

Table 2.1. GDP Components

No.	Sector
1	C-Motor Vehicles
2	C-Furniture & Appliances
3	C-Other Durables
4	C-Food & Beverages
5	C-Clothing & Shoes
6	C-Gasoline & Oil
7	C-Fuel Oil & Coal
8	C-Other Nondurables
9	C-Housing Services
10	C-Household Electric Services
11	C-Household Natural Gas Services
12	C-Other Household Services
13	C-Transportation Services
14	C-Medical Services
15	C-Other Services
16	I-Nonresidential Equipment
17	I-Nonresidential Structures
18	I-Residential Structures
19	I-Residential Equipment
20	I-Manufacturing Inventory Change
21	I-Retail Trade Inventory Change
22	I-Wholesale Trade Inventory Change
23	I-Other Nonfarm Inventory Change
24	I-Farm Inventory Change
25	Exports
26	Imports
27	G-National Defense
28	G-Federal Nondefense
29	G-State & Local Government
C: Consumption I: Investment G: Government	

For an I/O application, there must be an industrial distribution of final demand categories with entries for each of the 85 rows of the final demand array in Figure 2.1. Thus, to convert from these 29 forecast categories to the 85 industries, a "bridge" is used. For example, for category 16, Nonresidential Equipment (Producers Durable Equipment), there would be non-zero row entries corresponding to a number of producing sectors, including machine tools, motor vehicles, other transportation equipment, etc. Let matrix H represent this distribution after normalization to a per-dollar-of-final-demand basis. That is, an element of H, h_{ij}, represents the amount of commodity i sold per dollar's worth of final demand category j. Because this distribution is fairly stable over time, one can translate a given vector of GDP final demand categories into a vector of commodity demands via the matrix expression.

$$F = HG \tag{2.1}$$

The dimension of H in SEADS is 85x29. H is commonly referred to as a bridge matrix, because it is used to bridge between the GDP category and commodity levels of final demand.

2.3 Industry Output

The next step is to compute the levels of output that would be required to satisfy the final demands by commodity (F). In *standard* I/O analysis, the fundamental identity is

$$X_c = AX_c + F \tag{2.2}$$

where: A = an nxn matrix of direct requirements coefficients,
X_c = an nx1 vector of outputs, and
F = an nxl vector of final demands.

A is defined on a commodity-by-commodity basis, where a_{ij} represents the amount of commodity i required in the production of a dollar's worth of commodity j. From Equation (2.2), the solution for F is obtained by:

$$X_c = (I-A)^{-1}F \tag{2.3}$$

$(I-A)^{-1}$ is commonly known as the Leontief inverse.

This simple solution to Equation (2.2) is based on the existence of a commodity-to-commodity direct requirements table, A. Such a table is not published as part of the official I/O accounts for the United States. Rather, the U.S. Department of Commerce in the 1972 and subsequent input-output studies has released two separate tables, a "use" table and "make" table. The use table shows the value of each commodity *used* by each industry. The make table, on the other hand, shows the value of each commodity *produced* by each industry.

By using the use and make matrices, some organizations have generated estimates of commodity-by-commodity tables for the 1972 and 1977 U.S. input- output studies. SEADS, however, has followed an alternative approach used by the U.S. Department of Commerce (BEA 1994). This approach employs what is termed an industry-technology assumption, which assumes that industries employ commodities in fixed proportion to their total *industry* (rather than commodity) output. To determine industry output, a second assumption must also be made, namely that the market shares by each industry in the production of a specific commodity remain constant.

The derivation of the solution for industry output using these assumptions is somewhat tedious and will not be given here. The final result is:

$$X = D\,(I-BD)^{-1}F \tag{2.4}$$

where: I = the identity matrix
X = a vector of industry outputs
F = a vector of final demands by commodity
D = an industry-by-commodity matrix in which entries in each column show for a given commodity the proportion of total output of that commodity produced in each industry. D is referred to as the market share matrix, and is constructed from the Make matrix.
B = a commodity-by-industry matrix in which entries in each column show the amount of a commodity used by an industry per dollar of output of that industry. This is constructed from the Use matrix.

In the development of this version of SEADS, the matrix $D(I-BD)^{-1}$ for all core years except 1982 was computed from the use and make matrices provided by the Long-Term Growth Project of the BLS. For 1982, the official benchmark table was used. A benchmark table for 1987 is also provided. This total requirements matrix is represented by the box labeled "Input-Output Table" in Figure 2.1.

The core data include four BLS total requirements matrices in 1982 dollars and two BLS matrices in 1987 dollars. The BLS tables in 1987 dollars were developed using the 1982 Standard Industrial Classification (SIC) definitions, which were significantly revised with the publication of the 1987 benchmark I/O table. Constant dollar tables are needed for comparison through time, so we have provided the BLS tables. The benchmark 1987 table is also provided, although this table is not comparable with the other tables because of the SIC changes.

2.4 Energy Intensities

The computation of energy intensities was straightforward. Energy-use data by industry and fuel were taken from the National Energy Accounts (NEA; Jack Faucett Associates 1989), which contain data for the period from 1958 to 1985. Fuel types were aggregated to four major categories: coal, natural gas, oil and electricity. The industry data were converted to the BEA industries using a concordance based on SIC codes (Office Management Budget [OMB] 1987). Data for 1987 and 1990 were constructed to match with the Manufacturing Energy Consumption Survey (MECS) data for manufacturing for 1988 (Energy Information

Administration [EIA] 1991) and 1991 (EIA 1994), and for other industries based on Annual Survey (Bureau of the Census 1992) and Census (Bureau of the Census 1990) data.

To generate historical energy intensities, historical output data were taken from the Office of Economic Growth in the BLS. After aggregation to the BEA basis, the outputs were scaled to match the industry outputs from the core year I/O table. Intensities for each fuel type were then computed as simply the energy use by industry sector divided by the industry output.

SEADS-PC saves the results of calculating the projected or simulated energy use by industry. In matrix notation the energy-use matrix is calculated as:

$$E = e.X \tag{2.5}$$

where: E = energy use, with dimension: industry x fuel type
e = a matrix of energy intensities (for a specific year) of dimension fuel type x industry
. = a dot product operation, i.e., X is diagonalized before matrix multiplication.

Using the matrix E, energy consumption for any desired aggregation of industries can be easily calculated. A similar set of intensities for jobs and hours allows for the computation of labor use based on generated industry output.

2.5 Relation of Equation Variables to SEADS Variables

To go from the 29 final demand categories (G) to the matrix of energy use/employment by industry the complete procedure in SEADS requires the calculation of F (Equation 1), then the following matrix expression:

$$E = e.\ [D\ (I-BD)^{-1}]\ F \tag{2.6}$$

In the instructions that follow in the next section, the user will generally select a set of these various components in Equation (2.6) to perform a wide variety of analyses. In addition to selecting these files, the user may wish to edit any of the various arrays for which editing is allowed to tailor the analysis to some special purpose applications. For employment impacts rather than energy impacts, there is a third set of variables: an employment multiplier that allows the translation from national employment impacts to state-level impacts. To facilitate these applications, the SEADS variables corresponding to these components are listed in Table 2.2 (a single bridge matrix is provided by the program—it is contained in a file called BRIDGE.DBF).

2.6 The Core Data Set

The data that have been constructed for SEADS include I/O tables for a variety of years, energy intensities for most of the years, labor intensities for these years, and final demands for the core set of

Table 2.2. Correspondence Between Variables and Data Files

Matrix/Vector	SEADS	Description
G	gp1987.dbf	GDP Components, 1987
F	fd1987.dbf	Aggregate Final Demand, 1987
$D(I-BD)^{-1}$	io1987.dbf	Input-Output Table for 1987
e	ei1987.dbf	Energy Intensity for 1987
l	li1987.dbf	Labor Intensities for 1987
lm	lm1990.dbf	Jobs Multiplier
hm	hm1990.dbf	Hours Multiplier

years. There are seven I/O tables: for 1977, 1982, 1987 and 2005, all in 1982 constant dollars (naming convention: "io1987.dbf"); and for 1987 and 1990 in 1987 dollars ("io8787.dbf" and "io8790.dbf") based on the 1982 SIC definitions; and the benchmark 1987 table ("io87bm.dbf"). There are also seven final demand vectors with similar naming conventions (i.e., "fd1977.dbf" for $1982; "fd8790.dbf" for $1987, and "fd87bm.dbf" for the benchmark final demands) and seven labor intensities (prefix "li") similarly named. There are only six energy intensity files (prefix "ei"), matched to all except the 2005 data, for which there are no adequate forecasts. There is only one file for each of the labor and hours multipliers (prefixes "lm" and "hm") for 1990. These files share the national totals to the state level and are constructed for only one year. A bridge matrix is also provided, "bridge.dbf" based on the 1987 final demands, that maps from the gp files to the fd files. Experiments with the 1977 and 1987 data suggest that this bridge does not change significantly over time.

2.7 Industry Classification

The industry classification used in this version of SEADS-PC is one that is used by the BEA, U.S. Department of Commerce, and it might be termed the standard I/O (85-Sector) classification. This classification is shown in Table 2.3, and is based on the 1982 SIC (BEA 1991). The sector classification changed substantially in 1987; we have retained the 1982 industry definitions.

Table 2.3. Industry Sectors in SEADS[a]

No./ Industry	
1 Livestock and livestock products	44 Farm and garden mach.
2 Other agri. products	45 Construction and mining mach.
3 Forestry and fishery products	46 Materials handling mach. and equip.
4 Agri., forestry, and fishery serv.	47 Metalworking mach. and equip.
5 Iron and ferroalloy ore mining	48 Special industry mach. and equip.
6 Nonferrous metal ore mining	49 General industrial mach. and equip.
7 Coal mining	50 Misc. mach. except elec.
8 Crude petroleum and natural gas	51 Office, computing, and accounting equip.
9 Stone and clay mining and quarrying	52 Serv. industry machines
10 Chem & fertilizer mineral mining	53 Elec. industrial equip. and apparatus
11 New construction	54 Household appliances
12 Maintenance and repair construction	55 Elec. lighting and wiring equip.
13 Ordinance and accessories	56 Radio, TV, and communications equip.
14 Food and kindred products	57 Elec. components and accessories
15 Tobacco	58 Misc. elec. mach. and supplies
16 Broad and narrow fabrics	59 Motor vehicles and equip.
17 Misc. textiles and flooring	60 Aircraft and parts
18 Apparel	61 Other transportation equip.
19 Misc. fabricated textiles	62 Scientific and controlling instr.
20 Lumber and wood products	63 Optical, ophthalmic, and photo equip.
21 Wood containers	64 Misc. mfg.
22 Household furniture	65 Transportation and warehousing
23 Other furniture and fixtures	66 Communications, except radio and TV
24 Paper and allied products	67 Radio and TV broadcasting
25 Paperboard containers and boxes	68 Elec., gas, water, and sanitary serv.
26 Printing and publishing	69 Trade
27 Chemicals and selected products	70 Finance and insurance serv.
28 Plastics and synthetic materials	71 Real estate
29 Drugs, cleaning and toilet prep.	72 Hotel and lodging serv.
30 Paints and allied products	73 Business serv.
31 Petroleum refining industries	74 Eating and drinking places
32 Rubber and misc. plastics	75 Automobile repair serv.
33 Leather tanning and finishing	76 Amusements
34 Footwear and other leather products	77 Health, education, and social serv.
35 Glass and glass products	78 Federal government enterprise
36 Stone and clay products	79 State and local government enterprise
37 Primary iron and steel mfg.	80 Noncomparable imports
38 Primary nonferrous metal mfg.	81 Scrap
39 Metal containers	82 Government industry
40 Fabricated structural metal products	83 Rest of the world industry
41 Screw machine prod and stampings	84 Household industry
42 Other fabricated metal products	85 Inventory valuation adjustment
43 Engines and turbines	

(a) agri. = agricultural; elec. = electrical; equip. = equipment; instr. = instruments; mach. = machinery; mfg. = manufacturing; misc. = miscellaneous; prep. = preparations; serv. = services.

3.0 SEADS-PC Capabilities

Installation of SEADS-PC makes various program options and computational capabilities available to you, as described in the following sections.

3.1 Installation

SEADS-PC is installed by following the instruction in the READ.ME file that comes with the SEADS diskettes. The installation kit includes two diskettes. The first of these is put into the diskette drive (A:\, for example), and the Run option is selected under the File selection under Program Manager. The Run command would be A:SETUP. The data files are loaded by copying all of the core files from the subdirectory A:\DBF to a similar subdirectory under the SEADS directory.

3.2 Program Options

SEADS-PC includes the use of various screens and options that are described here.

SEADS Screen. Once installed, the program is invoked by double-clicking on the SEADS icon. The opening window of SEADS has six options on the options bar at the top of the screen, but under the title bar. The **Select Files** options allows you to load files for each of the bulleted items show in the middle of the screen. The **Edit File** option allows you to edit selected files. The **New** and **Save As...** options allow you to copy and rename existing files to modify them. The **Set Defaults** option establishes a set of selected files as the default files to load whenever SEADS is invoked; and the **Exit** option returns you to the Windows Program Manager.

The major part of the opening screen is a matrix with three column headings and three major row headings. The columns are labeled File Type, Selected Files/Options, and Computational Options. The headings that define the major rows are labeled Macro Specification, Energy Specifications, and Labor Specifications. Under the File Type column and in the Macro Specification row, three files types are identified—GDP, Final Demand, and I/O Table. Once a set of default files has been identified, these are loaded automatically and will be identified under the second column. If these are blank, the user should invoke Select Files to identify a set of files to work with. There are two function buttons under the first column labeled **FUEL TYPE** and **LABOR REGION**. The first allows you to choose the set of fuels you wish to include in the analysis; the second allows you to specify a region or state to examine for employment impacts. The second column will identify what options are chosen using these buttons; the defaults are all fuel types and the entire Unites States.

Under the third column are three buttons that perform the calculations for the SEADS tool. The first of these, labeled **GENERATE FINAL DEMAND** performs the calculation shown in Equation 2.1. Using a bridge matrix, it maps from the 29 components of GDP to the 85-component final demand vector. When this option is invoked, SEADS will ask for a file name for the newly created file. The second button, labeled **COMPUTE**

ENERGY USE, performs the calculation of Equation (2.5), where e is energy intensity. Progress during these calculations is indicated on a overlay screen. The third button is labeled COMPUTE LABOR USE, and this button calculates Equation (2.5) using labor and hours intensities rather than energy intensities. Further, if a region or a state has been selected, the results for the United States will be shared down to the state or region based on state level employment information by industry. If the default is used, there is no need for this sharing down to occur. This computation also reports progress with an indicator.

If a region or state is selected, the mouse is clicked on the LABOR REGION button and a map of the United States (sans Hawaii, which will be included in the next release) appears. Buttons on the right-hand side of the map provide six pre-defined regions: WESTERN, EASTERN, CENTRAL, GREAT LAKES, COASTAL, and ENTIRE U.S. Below these regions are two additional buttons, a CLEAR ALL button that clears all current specified states/regions, and an OK button that returns you to the main program. When you first enter this map, all states are displayed in yellow, indicating that the default, Entire U.S., is currently invoked. By clicking on a state, that state changes color, indicating that a new region has been defined, consisting of all states except the one on which you clicked. To define a particular region, first hit CLEAR ALL, then click on the states of interest. When these are colored and the remainder of the map is not, you have specified a Custom Region, which will be indicated in the box under the second column headings when you return to the main menu. If you wish to delete a state from a Custom Region, just click on it a second time and it will be removed from that user-defined region.

Select Files Screen. When you select this option, a File Selector screen appears that shows the files currently selected, the directory and files within which you are operating (usually C:\SEADS\DBF*.*) and three buttons: SELECT, CLEAR, and RETURN. To the left of the selected files is a column of file types, with bullet-like buttons on the extreme left. By selecting a bullet, a black dot will fill the bullet, indicating that you are doing something with this type of file. For example, if you select Final Demand, you could clear the current file or you could identify a file from those shown in the File Names section to use for this exercise. Final demand files are identified by the fd prefix, then a year, then the extension dbf. So if you identify "fd1987.dbf" from the file names, then click on the SELECT button, that file will appear in the Selected Files area for that file type. Because each file type has a predefined form, you will receive an error message if you select an incorrect file type. When all necessary files for your analysis are selected, click on the RETURN button and the program reverts to the SEADS main menu.

Edit File Screen. When you invoke the Edit File option from the main menu, the editor will load the file currently identified by the highlighted button to the left of the selected file. If you wish to edit the final demand vector that you create from a GDP forecast, invoke this option with the highlighted button on the created file, and the next screen you see will be a standard Windows edit screen with the operating cell where changes are made at the top of the editor. The remainder of the screen is filled with three columns: the first column contains the number of the sector; the second contains the title for this sector, and the third contains the values currently in the aggregate final demand vector. If you want to change the current value for row 35, Glass and Glass Products, simply 1) click on that cell, which loads row 35 into the editor, 2) click on the edit cell and make changes in the edit box, and 3) hit Enter. When all editing is complete, you can save the file

under its current name or a different name (the **Save** or **Save As...** options). The **Cancel** option restores the file to its original state. The **Units** option tells the user the units for the current numbers. Finally, the **Return** option returns you to the main menu. If you have not saved the file, your changes will not be saved.

New and Save As... Screens. Both of these options invoke the New File Name menu screen, which either allows you to substitute a new file for the current file identified with the highlighted bullet or save that file under a different name.

Set Defaults Screen. Once a set of files has been selected, using this option will identify this set of files as the one you want to load the next time you enter SEADS.

Exit Option. This option returns computer control to the Windows Program Manager.

3.3 Computation of Labor and Energy Impacts

When either the **COMPUTE ENERGY USE** or the **COMPUTE LABOR USE** buttons are invoked at the main menu, Equation (2.5) is computed with the files that were identified. When the calculation is complete, the results are shown on the next screen. These results can be saved under a new name, printed, or compared with a prior run; the units used can be shown, a summary table of the results can be shown, or you can return to the main menu. These are in the options bar at the top of the page and their functions are described here.

Save As... Option. This invokes the New Name screen and allows you to save results under a different name, and it is identical to the same option under the main menu. When a file is saved, it is saved under a *.dbf format, with a corresponding file with a *.dbs designation. This latter file contains all relevant information about what files were used to produce this result and the date and time of the run.

Print Option. This option allows you to print either to a printer (the Windows default) or to a file. If the Print-to-File option is selected, the results will be printed to a text file that a can then be accessed by a word processing package. When you print to a file, the relevant data contained in the *.dbs file will be printed along with the results.

Compare Option. With this option, you can compare the current results with results obtained from a prior run. Just identify the previously named file and these two files will be compared. The Results screen is similar to the Energy (Employment) Results screen, except that now both the results and the differences are shown on the screen. You can scroll down to the bottom of the results to see the total impact. The Save As... option here is the same as it is on the Results screen.

Summary Option. This option can be invoked from either the Results screen or the Compare screen. The Results Summary would show energy use by fuel type for the entire economy and energy use by major sectors—Agriculture, Mining, Construction, Manufacturing, Services, Other, and Total—for each fuel. From the comparison option, these headings would show both scenarios and the difference between the two. When the Summary Print-to-File option is employed, these final results, along with the two scenario descriptions, are all printed to the file name that you identify.

Units and Return Options The Units option is the same as it is in the Edit File menu. The Return option returns to the SEADS main menu.

3.4 SEADS and Spreadsheets

SEADS is designed to be used with any of the major spreadsheet programs currently available under Windows—Quattro Pro, Lotus 1-2-3, or Excel. Any of these packages will read and write *.dbf files, making it easy to structure special analytical files. Most users will find it more convenient to structure analysis files in a spreadsheet environment than to use the editor provided in SEADS. Because all files are stored in dBase format, it is important that revisions to existing files preserve the structure of the original dBase files. The most efficient way to ensure this is to copy the appropriate set of numbers from a working spreadsheet, close the spreadsheet file, then paste these numbers into a template for the appropriate file. The naming convention for a template is ??_FORM.DBF, where ?? will be FD, EI, or any other label that is allowed. Be sure that when you save this file you do not overwrite the template. The template files are stored in the C:\SEADS directory. An example of how this is done is provided in the next section. In addition, if the comparison of results is to be shown, it is necessary to read in the results.dbf files and take the differences between these two files to show as a comparison file.

4.0 An Example Application: The Climate Change Action Plan

This section describes how to perform an analysis with the SEADS-PC system, using as an example the President's proposed Climate Change Action Plan (CCAP). More detailed tables and results files are in the Appendix.

4.1 Final Demand Changes

For this analysis, two final demand vectors were provided: one a base case for the year 2000, the other the same final demands under the CCAP. Table 4.1 shows the summary results file saved during a comparison between the base case and CCAP case using the I/O table for 2005 and employment intensities for 2005.

Table 4.1. Summary Results File Showing Comparison Between Base Case and CCAP Case (Using I/O table and Employment Intensities for 2005)

Specifications and Results:
Date: 01-25-1995
Time: 17:19:23
Case 1 specifications:
GDP: C:\SEADS\DBF\GP1990.DBF
Final demand: C:\SEADS\DBF\FDD2000B.DBF
IO table: C:\SEADS\DBF\IO2005.DBF
Energy intensity: C:\SEADS\DBF\EI1990.DBF
Labor intensity: C:\SEADS\DBF\LI2005.DBF
Jobs multiplier: C:\SEADS\DBF\LM1990.DBF
Hours multiplier: C:\SEADS\DBF\HM1990.DBF
Labor region: US
Results: Labor use
Results units:
Jobs -- Millions
Hours -- Millions
Case 2 specifications
Date: 01-25-1995
Time: 11:02:29
Case files selected:
GDP:\
Final Demand: C:\SEADS\DBF\FDD2000C.DBF
IO table: C:\SEADS\DBF\IO2005.DBF
Energy intensity: C:\SEADS\DBF\E11990.DBF
Labor intensity: C:\SEADS\DBF\LI12005.DBF
Jobs multiplier: C:\SEADS\DBF\LM1990.DBF
Hours multiplier: C:\SEADS\DBF\HM1990.DBF
Labor region: US

The difference between these two scenarios (in 1990 dollars) is shown in Table 4.2. Overall there is very little difference between these final demand vectors, with the difference for all industries adding up to only $192.8 million, with CCAP expenditures slightly higher by that amount. While this sum is small, there are some large differences between the two scenarios for some categories of final demand. The largest of these are for new construction (larger under CCAP by $2.3 billion), petroleum refining (lower under CCAP by nearly $2.8 billion), and electric and gas utility sales (lower under CCAP by $3.8 billion). The decline in energy sales through these two major sectors are compensated for by smaller changes in many other industries.

These final demand changes are both in 1990 dollars, so the first task was to convert these to 1982 dollars (the constant dollar value for the 2005 I/O table). To convert the final demand vectors to 1982 dollars the output deflators were first converted to final demand deflators by postmultiplying the output deflators by the inverse of the total requirements matrix, as given in Equation 2.4.[a] This vector of final demand deflators was then multiplied, element by element, by both the CCAP and the 2000 base final demand vectors. Then both of these deflated final demand vectors were run through SEADS using both the 1990 and the 2005 I/O tables to conduct the analysis. The deflation procedure reduces the value of the final demand vector from $6.25 trillion to almost $5 trillion and reduces the CCAP expenditures so that they are now smaller than the base case by $886 million. These differences are shown in Appendix A, Table A.5.

4.2 CCAP Labor Impacts: The Procedure

Eight runs were performed to assess the employment impact of the President's CCAP. SEADS was employed for both the base case and the CCAP final demands using two different sets of I/O tables (1990 and 2005) and two sets of labor intensities (again 1990 and 2005). The results were saved as *.dbf files and the comparisons were saved as print files that contain information about the runs, an example of which is shown in Table 4.1. Table 4.3 was constructed by loading the results files into Lotus 1-2-3, copying the information, closing the file, then pasting the data to a standard *.wk3 file. (This procedure is necessary in Lotus, because the template for an *.dbf file will override the calculations and only part of the data will be saved, even if the file is saved using the Save As... option.) Results from each of the *.dbf files for the eight runs was likewise copied to a spreadsheet, then organized to be written to a disk file for loading into WordPerfect. All of the files included in this analysis are included with the installation kit, so that any or all of the results can be duplicated.

(a) The same relationship holds between the output deflator and the final demand deflator as holds for output and final demand in Equation 2.4. Because BLS supplies the output deflators (1982 = 100) for each year from 1958 to 1990, it is a simple matter to take the output deflator for 1990, substitute the deflator series for X in Equation 2.4, then solve the equation for the final demand deflators by premultiplying each side of the equation by the inverse of the total requirements matrix. The result is the final demand deflator that was applied to the CCAP and base case final demands.

Table 4.2. Base Case and CCAP Final Demands

No./Industry Description	Base 2000	CCAP 2000	Difference
1-6 Six Industries	45562.9	45579.6	-16.7
7 Coal mining	5363.7	5316.9	46.8
8-10 Three Industries	-41440.6	-41440.1	-0.5
11 New construction	512510.1	514858.5	-2348.4
12 Maintenance and repair construction	60522.3	60633.2	-110.9
13 Ordinance and accessories	23217.8	23171.6	46.2
14 Food and kindred products	249208.2	249279.0	-70.8
15-21 Seven Industries	94242.9	94307.9	-65.0
22 Household furniture	21587.7	21693.1	-105.4
23 Other furniture and fixtures	24570.7	24689.3	-118.6
24 Paper and allied products	21213.2	21015.7	197.5
25-30 Six Industries	140481.9	140566.0	-84.1
31 Petroleum refining industries	58993.8	56237.3	2756.5
32-50 Nineteen Industries	154106.3	154677.3	-541.0
51 Office, computing, and accounting equipment	161818.9	162165.3	-346.4
52 Service industry machines	16141.2	16205.4	-64.2
53 Electric industrial equipment and apparatuses	10394.2	10507.7	-113.5
54 Household appliances	18686.2	18757.9	-71.7
55 Electric lighting and wiring equipment	3619.2	3632.9	-13.7
56 Radio, TV, and communications equipment	35124.0	35521.3	-397.3
57 Electronic components and accessories	4740.9	4608.4	132.5
58 Misc. electrical machinery and equipment	25372.9	25432.6	-59.7
59 Motor vehicles and equipment	185378.9	185670.2	-291.3
60 Aircraft and parts	107893.6	107916.0	-22.4
61 Other transportation equipment	27720.4	27800.8	-80.4
62 Scientific and controlling instruments	78954.1	79048.0	-93.9
63 Optical, ophthalmic, and photography equipment	19736.7	19827.1	-90.4
64 Miscellaneous manufacturing	25368.0	25421.5	-53.5
65 Transportation and warehousing	178391.7	178466.7	-75.0
66 Communications, except radio and TV	119583.3	119729.3	-146.0
67 Radio and TV broadcasting	19559.2	19559.4	-0.2
68 Electric, gas, water, and sanitary services	142219.8	138416.4	3803.4
69 Trade	925122.3	926096.5	-974.2
70 Finance and insurance services	306537.5	306620.1	-82.6
71 Real estate	575473.4	575880.3	-406.9
72-76 Five Industries	617145.7	617250.9	-105.2
77 Health, education, and social services	740964.0	741166.9	-202.9
78-85 Nine Industries	537882.7	537875.7	7.0
TOTALS	6253970.0	6254162.8	-192.8

Table 4.3. Summary of Findings (Various I/O and Labor Intensity Assumptions [In millions except Jobs Difference in units])

Year	Base Case	CCAP Case	Difference	Base Case	CCAP Case	Difference
	Labor Intensity 1990			Labor Intensity 2005		
Total Jobs						
1990 I/O	127.226	127.273	-47,400	130.284	130.340	-56,600
2005 I/O	126.075	126.135	-60,100	127.237	127.307	-69,500
Total Hours						
1990 I/O	239435.12	239522.79	- 87.67	250256.86	250367.86	-111.00
2005 I/O	237674.25	237786.59	-112.34	244523.11	244658.63	-135.52

4.3 Labor Impacts: Results

The results of the eight sets of calculations are shown Table 4.3. In all cases the results are strikingly similar. Under the total jobs section of the summary findings, there is a difference between the Base Case and the CCAP case of between -47,400 and -69,500 jobs; the lower number is derived when the 1990 I/O and 1990 labor intensity are used, the higher when both the 2005 I/O and labor intensity are used. This means that there are between 47,000 and 70,000 more jobs under the CCAP case than under the base case. These results suggest that the CCAP will account for about 60,000 new jobs or about 115 million more hours worked per year in the year 2000.

The astute reader will notice that the calculations using the I/O table for 1990 should have used final demand vectors in 1987 dollars, because the I/O table is in those units, not in the vectors defined in 1982 dollars. This would give rise to some bizarre results except for the fact that the labor intensities are also defined in 1987 dollars. The same calculation using the 1990 I/O table (in 1987 dollars) and labor intensities for 1990 (again in 1987 dollars) but using the final demand vectors defined as in Table 4.2 (in 1990 dollars) provides differences that are nearly identical to the results using the I/O table and the labor intensities for 2005. Total jobs under CCAP, for example, are 69,800 more than under the base case (compared to 69,500) and hours increase by 130 million rather than the 135.5 million reported above.

5.0 References

Bureau of the Census. See U.S. Department of Commerce. Bureau of the Census.

Bureau of Economic Analysis (BEA). See U.S. Department of Commerce, Bureau of Economic Analysis.

Bureau of Labor Statistics. See U.S. Department of Labor, Bureau of Labor Statistics.

Energy Information Administration. See U.S. Department of Energy, Energy Information Administration.

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Appendix

Selected Detailed Tables and Results Files for the Example Application: Employment Implications of the Climate Change Action Plan

Appendix

Selected Detailed Tables and Results Files for the Example Application: Employment Implications of the Climate Change Action Plan

This appendix contains detailed print-outs for the comparison of the two final demand cases using the 1990 table and intensity and for the two cases using the 2005 table and intensity. The first two tables (A.1 and A.2) show the detailed results from these two comparisons. The second set of tables (A.3 and A.4) shows a typical comparison when you request that the results be saved to a file (only the summary results are shown here; the detailed results may also be printed). Finally, Table A.5 shows the details of the base case and CCAP final demand vectors in 1990 dollars, the differences, the values deflated to 1982 dollars, and the final demand deflator.

Table A.1. Base Case Jobs and Hours Compared to Climate Change Action Plan

I/O 1990 for both Base and CCAP LI 1990 for both Base and CCAP							
		Base Case		CCAP		Difference	
No.	Industry	Jobs	Hours	Jobs	Hours	Jobs	Hours
1	Livestock	1.4174	3220.843	1.4177	3221.683	-0.0003	-0.8398
2	Other agr	1.144	2517.607	1.1443	2518.271	-0.0003	-0.6636
3	Forestry	0.0731	162.5146	0.0732	162.6707	-1.0E-04	-0.1561
4	Agricultu	0.4703	1029.944	0.4706	1030.518	-0.0003	-0.5735
5	Iron and	0.0272	59.6033	0.0272	59.6644	0	-0.0611
6	Nonferrou	0.0032	6.996	0.0032	7.0067	0	-0.0107
7	Coal mini	0.0818	183.7563	0.081	181.9393	0.0008	1.817
8	Crude pet	0.0612	131.0846	0.058	124.1343	0.0032	6.9503
9	Stone and	0.0494	112.9234	0.0494	112.8748	0	0.0486
10	Chemical	0.0024	5.6175	0.0024	5.616	0	0.0015
11	New const	0.5175	1163.919	0.5193	1167.906	-0.0018	-3.9872
12	Maintenan	0.0166	37.7441	0.0166	37.7148	0	0.0293
13	Ordinance	0.3054	639.464	0.3049	638.4256	0.0005	1.0384
14	Food and	3.2646	6871.332	3.2654	6873.034	-0.0008	-1.7022
15	Tobacco	0.039	79.9334	0.039	79.947	0	-0.0136
16	Broad and	0.3306	691.8021	0.3309	692.456	-0.0003	-0.6539
17	Misc. tex	0.1519	327.7877	0.1523	328.566	-0.0004	-0.7783
18	Apparel	1.7981	3454.363	1.7988	3455.693	-0.0007	-1.3304
19	Misc. fab	0.3312	669.8539	0.3315	670.3784	-0.0003	-0.5245
20	Lumber an	0.5826	1218.192	0.5839	1220.802	-0.0013	-2.6103
21	Wood cont	0.0071	14.9265	0.0071	14.9538	0	-0.0273
22	Household	0.7125	1436.383	0.7159	1443.251	-0.0034	-6.8677
23	Other fur	0.4985	1036.973	0.5007	1041.578	-0.0022	-4.6052
24	Paper and	0.286	633.4821	0.2855	632.3783	0.0005	1.1038
25	Paperboar	0.1853	404.2308	0.1853	404.3112	0	-0.0804
26	Printing	1.5587	3146.577	1.5594	3147.985	-0.0007	-1.4087
27	Chemicals	0.3352	730.9066	0.3349	730.2413	0.0003	0.6653
28	Plastics	0.1624	350.4167	0.1625	350.6212	-1.0E-04	-0.2045
29	Drugs, cl	0.6059	1277.181	0.6059	1277.047	0	0.1342
30	Paints an	0.054	114.7288	0.0541	114.8597	-0.0001	-0.1309
31	Petroleum	0.2832	631.699	0.276	615.7584	0.0072	15.9406
32	Rubber an	0.6887	1459.93	0.6892	1461.148	-0.0005	-1.2175
33	Leather t	0.0045	9.138	0.0047	9.5779	-0.0002	-0.4399
34	Footwear	0.1053	207.184	0.1056	207.6977	-0.0003	-0.5137

Table A.1. (contd)

I/O 1990 for both Base and CCAP LI 1990 for both Base and CCAP							
		Base Case		CCAP		Difference	
No.	Industry	Jobs	Hours	Jobs	Hours	Jobs	Hours
35	Glass and	0.1471	315.178	0.1472	315.4381	-0.0001	-0.2601
36	Stone and	0.4055	873.5022	0.4062	874.9788	-0.0007	-1.4766
37	Primary i	0.3699	810.9413	0.3703	811.8192	-0.0004	-0.8779
38	Primary n	0.3595	778.3444	0.36	779.5193	-0.0005	-1.1749
39	Metal con	0.0558	125.5973	0.0557	125.4882	0.0001	0.1091
40	Fabricate	0.4591	968.9094	0.4599	970.6609	-0.0008	-1.7515
41	Screw mac	0.3055	655.1812	0.3058	655.9042	-0.0003	-0.723
42	Other fab	0.4369	924.5176	0.4376	925.9562	-0.0007	-1.4386
43	Engines a	0.1233	266.7726	0.1233	266.7395	0	0.0331
44	Farm and	0.2401	512.1072	0.241	514.0291	-0.0009	-1.9219
45	Construct	0.2924	635.4653	0.2928	636.4799	-0.0004	-1.0146
46	Materials	0.1294	274.294	0.1298	275.1289	-0.0004	-0.8349
47	Metalwork	0.112	243.2275	0.1132	245.9061	-0.0012	-2.6786
48	Special i	0.2568	547.3252	0.2575	548.9184	-0.0007	-1.5932
49	General i	0.6846	1472.572	0.6856	1474.78	-0.001	-2.2089
50	Misc. mac	0.104	224.2609	0.1042	224.5347	-0.0002	-0.2738
51	Office, c	3.7615	7971.841	3.7692	7988.171	-0.0077	-16.3301
52	Service i	0.2427	504.9201	0.2433	506.3255	-0.0006	-1.4054
53	Electric	0.3254	695.6024	0.3266	698.1318	-0.0012	-2.5294
54	Household	0.2834	581.7142	0.2844	583.7535	-0.001	-2.0393
55	Electric	0.1708	355.2979	0.1711	355.9763	-0.0003	-0.6784
56	Radio, TV	0.5528	1176.484	0.5579	1187.21	-0.0051	-10.7255
57	Electroni	0.6914	1439.685	0.6921	1441.065	-0.0007	-1.3799
58	Misc. ele	0.3653	774.9645	0.366	776.4367	-0.0007	-1.4722
59	Motor veh	1.8964	4117.941	1.899	4123.624	-0.0026	-5.6826
60	Aircraft	1.9991	4256.481	1.9995	4257.239	-0.0004	-0.7583
61	Other tra	0.5134	1067.588	0.5147	1070.276	-0.0013	-2.6883
62	Scientifi	1.1895	2493.895	1.1907	2496.374	-0.0012	-2.4793
63	Optical,	0.2149	451.4417	0.2155	452.6247	-0.0006	-1.183
64	Miscellan	0.5816	1200.571	0.5825	1202.468	-0.0009	-1.8973
65	Transport	3.4534	6969.996	3.4517	6966.486	0.0017	3.5098
66	Communica	0.883	1873.344	0.8837	1874.744	-0.0007	-1.4001
67	Radio and	0.6573	1229.124	0.6574	1229.351	-1.0E-04	-0.2271
68	Electric,	0.8984	1947.051	0.8856	1919.358	0.0128	27.6936
69	Trade	24.9764	43739.29	24.9975	43776.13	-0.0211	-36.8398

Table A.1. (contd)

I/O 1990 for both Base and CCAP LI 1990 for both Base and CCAP							
		Base Case		CCAP		Difference	
No.	Industry	Jobs	Hours	Jobs	Hours	Jobs	Hours
70	Finance a	5.2902	10020.91	5.2901	10020.62	0.0001	0.2881
71	Real esta	1.2943	2483.634	1.2943	2483.719	0	-0.0845
72	Hotel and	3.5591	6280.34	3.5599	6281.831	-0.0008	-1.4908
73	Business	7.9556	14779.42	7.9577	14783.34	-0.0021	-3.9228
74	Eating an	8.232	11053.06	8.2322	11053.32	-0.0002	-0.2588
75	Automobil	1.7769	3485.847	1.7772	3486.432	-0.0003	-0.5852
76	Amusement	1.2449	1953.017	1.2452	1953.439	-0.0003	-0.4223
77	Health, e	19.3815	33291.92	19.3864	33300.3	-0.0049	-8.3789
78	Federal g	0.5881	1228.148	0.5878	1227.565	0.0003	0.5823
79	State and	1.0437	2213.289	1.0414	2208.417	0.0023	4.8728
80	Noncompar	0	0	0	0	0	0
81	Scrap	0	0	0	0	0	0
82	Governmen	12.563	26131.02	12.563	26131.02	0	0
83	Rest of t	0	0	0	0	0	0
84	Household	0	0	0	0	0	0
85	Inventory	0	0	0	0	0	0
86	Total	127.2258	239435.1	127.2732	239522.7	-0.0474	-87.671

Table A.2. Base Case Jobs and Hours Compared to Climate Change Action Plan

I/O 2005 for Both Base and CCAP LI 2005 for both Base and CCAP							
		Base Case		CCAP		Difference	
No.	Industry	Jobs	Hours	Jobs	Hours	Jobs	Hours
1	Livestock	2.4997	5679.011	2.5005	5680.668	-0.0008	-1.6568
2	Other agr	2.6411	5811.958	2.6419	5813.693	-0.0008	-1.7349
3	Forestry	0.2778	617.1246	0.2781	617.8082	-0.0003	-0.6836
4	Agricultu	1.5565	3407.973	1.5575	3410.187	-0.001	-2.2139
5	Iron and	0.0221	48.4385	0.0221	48.5104	0	-0.0719
6	Nonferrou	0.0022	5.0185	0.0022	5.0289	0	-0.0104
7	Coal mini	0.1269	286.4341	0.1258	283.8192	0.0011	2.6149
8	Crude pet	0.0768	163.9854	0.0751	160.2155	0.0017	3.7699
9	Stone and	0.0274	62.6111	0.0274	62.6335	0	-0.0224
10	Chemical	0.0034	7.8244	0.0034	7.8282	0	-0.0038
11	New const	5.2229	11857.38	5.2392	11894.41	-0.0163	-37.0322
12	Maintenan	0.5303	1163.758	0.5301	1163.416	0.0002	0.3425
13	Ordinance	0.1239	254.7377	0.1237	254.3299	0.0002	0.4078
14	Food and	1.2915	2714.343	1.2919	2715.092	-0.0004	-0.7493
15	Tobacco	0.0222	45.4138	0.0222	45.4214	0	-0.0076
16	Broad and	0.3461	723.7605	0.3464	724.4883	-0.0003	-0.7278
17	Misc. tex	0.099	213.376	0.0992	213.8897	-0.0002	-0.5137
18	Apparel	0.4944	949.9213	0.4946	950.2973	-0.0002	-0.376
19	Misc. fab	0.107	216.6199	0.1071	216.7955	-0.0001	-0.1756
20	Lumber an	1.1696	2508.202	1.1721	2513.505	-0.0025	-5.303
21	Wood cont	0.0165	34.8027	0.0165	34.8678	0	-0.0651
22	Household	0.2229	449.51	0.224	451.6324	-0.0011	-2.1224
23	Other fur	0.1474	306.7733	0.1481	308.1426	-0.0007	-1.3693
24	Paper and	0.4501	998.0058	0.4497	997.0176	0.0004	0.9882
25	Paperboar	0.1686	367.8141	0.1687	368.0372	-1.0E-04	-0.2231
26	Printing	1.3436	2712.461	1.3444	2714.109	-0.0008	-1.6475
27	Chemicals	0.3322	724.245	0.3321	724.2108	0.0001	0.0342
28	Plastics	0.1464	315.8497	0.1465	316.1121	-0.0001	-0.2624
29	Drugs, cl	0.3296	694.9766	0.3297	695.0552	-0.0001	-0.0786
30	Paints an	0.0538	114.2356	0.0538	114.3841	0	-0.1485
31	Petroleum	0.1289	285.3006	0.1267	280.4814	0.0022	4.8192
32	Rubber an	0.2706	544.8731	0.2709	545.4358	-0.0003	-0.5627
33	Leather t	0.0009	1.7864	0.0009	1.8741	0	-0.0877
34	Footwear	0.0017	3.4015	0.0017	3.4097	0	-0.0082

Table A.2. (contd)

I/O 2005 for Both Base and CCAP LI 2005 for both Base and CCAP							
		Base Case		CCAP		Difference	
No.	Industry	Jobs	Hours	Jobs	Hours	Jobs	Hours
35	Glass and	0.0073	15.68	0.0073	15.7016	0	-0.0216
36	Stone and	0.0858	141.4406	0.086	141.7089	-0.0002	-0.2683
37	Primary i	3.394	7253.293	3.399	7263.929	-0.005	-10.6362
38	Primary n	1.5485	3405.981	1.5513	3411.951	-0.0028	-5.9698
39	Metal con	0.0393	88.5409	0.0393	88.5198	0	0.0211
40	Fabricate	0.4598	970.2691	0.4608	972.3594	-0.001	-2.0903
41	Screw mac	0.2578	553.2466	0.2581	553.8946	-0.0003	-0.648
42	Other fab	0.438	926.9031	0.4388	928.7079	-0.0008	-1.8048
43	Engines a	0.1206	260.6893	0.1206	260.6629	0	0.0264
44	Farm and	0.1451	309.503	0.1456	310.6912	-0.0005	-1.1882
45	Construct	0.1754	381.2212	0.1757	381.9181	-0.0003	-0.6969
46	Materials	0.0998	211.5132	0.1001	212.172	-0.0003	-0.6588
47	Metalwork	0.0972	207.9142	0.0983	210.354	-0.0011	-2.4398
48	Special i	0.2	426.1737	0.2006	427.5222	-0.0006	-1.3485
49	General i	0.6325	1356.26	0.6336	1358.486	-0.0011	-2.2264
50	Misc. mac	0.0202	43.7117	0.0202	43.755	0	-0.0433
51	Office, c	1.6885	3673.286	1.6919	3680.789	-0.0034	-7.5027
52	Service i	0.0956	199.1913	0.0959	199.7387	-0.0003	-0.5474
53	Electric	0.0731	153.844	0.0734	154.5062	-0.0003	-0.6622
54	Household	0.0642	131.9769	0.0644	132.4409	-0.0002	-0.464
55	Electric	0.0947	196.9264	0.0949	197.3066	-0.0002	-0.3802
56	Radio, TV	0.1416	301.5116	0.1428	303.9682	-0.0012	-2.4566
57	Electroni	0.254	529.4594	0.2543	529.9376	-0.0003	-0.4782
58	Misc. ele	0.0991	210.4862	0.0993	210.8669	-0.0002	-0.3807
59	Motor veh	2.0031	4238.751	2.006	4244.815	-0.0029	-6.0644
60	Aircraft	1.6215	3451.833	1.6218	3452.483	-0.0003	-0.6504
61	Other tra	0.2648	551.928	0.2655	553.3797	-0.0007	-1.4517
62	Scientifi	0.7445	1558.647	0.7453	1560.308	-0.0008	-1.6608
63	Optical,	0.157	329.4598	0.1574	330.3468	-0.0004	-0.887
64	Miscellan	0.1863	384.7673	0.1866	385.3927	-0.0003	-0.6254
65	Transport	3.1368	6334.903	3.1369	6335.017	-0.0001	-0.1143
66	Communica	0.9852	2090.239	0.986	2092.006	-0.0008	-1.7675
67	Radio and	0.2731	510.8904	0.2732	511.0763	-1.0E-04	-0.1859
68	Electric,	0.9137	1983.075	0.9009	1955.405	0.0128	27.6702
69	Trade	27.201	47620	27.2264	47664.54	-0.0254	-44.5313

Table A.2. (contd)

I/O 2005 for Both Base and CCAP LI 2005 for both Base and CCAP							
		Base Case		CCAP		Difference	
No.	Industry	Jobs	Hours	Jobs	Hours	Jobs	Hours
70	Finance a	5.2157	9876.104	5.2161	9876.783	-0.0004	-0.6797
71	Real esta	1.4022	2686.099	1.4025	2686.789	-0.0003	-0.6897
72	Hotel and	2.8896	5098.724	2.8904	5100.151	-0.0008	-1.4278
73	Business	10.5324	19566.24	10.5378	19576.2	-0.0054	-9.9609
74	Eating an	6.0702	8152.157	6.0708	8153.048	-0.0006	-0.8911
75	Automobil	1.6548	3245.479	1.6553	3246.392	-0.0005	-0.9133
76	Amusement	1.5881	2492.312	1.5886	2493.016	-0.0005	-0.7041
77	Health, e	11.4852	19735.91	11.4884	19741.28	-0.0032	-5.3672
78	Federal g	0.2718	567.6454	0.2718	567.6885	0	-0.0431
79	State and	1.2967	2749.393	1.2952	2746.201	0.0015	3.1921
80	Noncompar	0	0	0	0	0	0
81	Scrap	0	0	0	0	0	0
82	Governmen	16.8543	35057.61	16.8543	35057.61	0	0
83	Rest of t	0	0	0	0	0	0
84	Household	0	0	0	0	0	0
85	Inventory	0	0	0	0	0	0
86	Total	127.2374	244523.1	127.3067	244658.6	-0.0695	-135.5

Table A.3. Typical Comparison of the 2000 Base Case With 2000 CCAP Final Demands Results Saved to a File (Using 1990 Input-Output Table and Intensity)

Specifications and Results: Date: 08-14-1995 Time: 16:46:39
Case 1 specifications: GDP: C:\SEADS\DBF\GP1990.DBF Final demand: C:\SEADS\DBF\FDD2000B.DBF IO table: C:\SEADS\DBF\CORE\IO8790.DBF Energy intensity: C:\SEADS\DBF\CORE\EI1987.DBF Labor intensity: C:\SEADS\DBF\CORE\LI8790.DBF Jobs multiplier: C:\SEADS\DBF\LM1990.DBF Hours multiplier: C:\SEADS\DBF\HM1990.DBF Labor region: US
Results: Labor use
Results units: Jobs -- Millions Hours -- Millions
Case 2 specifications: Date: 08-14-1995 Time: 11:02:11
Case files selected: GDP: C:\SEADS\DBF\GP1990.DBF Final demand: C:\SEADS\DBF\FDD2000C.DBF IO table: C:\SEADS\DBF\CORE\IO8790.DBF Energy intensity: C:\SEADS\DBF\EIDUM.DBF Labor intensity: C:\SEADS\DBF\CORE\LI8790.DBF Jobs multiplier: C:\SEADS\DBF\LM1990.DBF Hours multiplier: C:\SEADS\DBF\HM1990.DBF Labor region: US
Results: Labor use

Table A.3. (contd)

Summary Results:			
	Case 1	Case 2	Difference
Jobs	1.27E+02	1.27E+02	-4.74E-02
Hours	2.39E+05	2.40E+05	-8.77E+01
Industry	Jobs 1	Jobs 2	Jobs Diff.
Agriculture	3.10E+00	3.11E+00	-1.00E-03
Mining	2.25E-01	2.21E-01	4.00E-03
Construction	5.34E-01	5.36E-01	-1.80E-03
Manufacturing	2.96E+01	2.96E+01	-3.53E-02
Services	4.87E+01	4.87E+01	-8.50E-03
Other	4.51E+01	4.51E+01	-4.80E-03
Total	1.27E+02	1.27E+02	-4.74E-02
Industry	Hours 1	Hours 2	Hours Diff.
Agriculture	6.93E+03	6.93E+03	-2.23E+00
Mining	5.00E+02	4.91E+02	8.75E+00
Construction	1.20E+03	1.21E+03	-3.96E+00
Manufacturing	6.21E+04	6.22E+04	-7.36E+01
Services	8.33E+04	8.34E+04	-1.49E+01
Other	8.53E+04	8.53E+04	-1.81E+00
Total	2.39E+05	2.40E+05	-8.77E+01

Table A.4. Typical Comparison of the 2000 Base Case with 2000 CCAP Results Saved to a File (Using 2005 Input-Output Table and Intensity)

Specifications and Results:
Date: 08-14-1995
Time: 16:44:52
Case 1 specifications:
GDP: C:\SEADS\DBF\GP1990.DBF
Final demand: C:\SEADS\DBF\FDD2000B.DBF
IO table: C:\SEADS\DBF\CORE\IO2005.DBF
Energy intensity: C:\SEADS\DBF\CORE\EI1987.DBF
Labor intensity: C:\SEADS\DBF\CORE\LI2005.DBF
Jobs multiplier: C:\SEADS\DBF\LM1990.DBF
Hours multiplier: C:\SEADS\DBF\HM1990.DBF
Labor region: US
Results: Labor use
Results units:
Jobs -- Millions
Hours -- Millions
Case 2 specifications:
Date: 08-14-1995
Time: 10:06:46
Case files selected:
GDP: C:\SEADS\DBF\GP1990.DBF
Final demand: C:\SEADS\DBF\FDD2000C.DBF
IO table: C:\SEADS\DBF\CORE\IO2005.DBF
Energy intensity: C:\SEADS\DBF\EIDUM.DBF
Labor intensity: C:\SEADS\DBF\CORE\LI2005.DBF
Jobs multiplier: C:\SEADS\DBF\LM1990.DBF
Hours multiplier: C:\SEADS\DBF\HM1990.DBF
Labor region: US
Results: Labor use

Table A.4. (contd)

Summary Results:			
	Case 1	Case 2	Difference
Jobs	1.27E+02	1.27E+02	-6.93E-02
Hours	2.45E+05	2.45E+05	-1.36E+02
Industry	Jobs 1	Jobs 2	Jobs Diff.
Agriculture	6.98E+00	6.98E+00	-2.90E-03
Mining	2.59E-01	2.56E-01	2.80E-03
Construction	5.75E+00	5.77E+00	-1.61E-02
Manufacturing	2.25E+01	2.25E+01	-2.95E-02
Services	4.08E+01	4.08E+01	-1.17E-02
Other	5.09E+01	5.09E+01	-1.21E-02
Total	1.27E+02	1.27E+02	-6.93E-02
Industry	Hours 1	Hours 2	Hours Diff.
Agriculture	1.55E+04	1.55E+04	-6.29E+00
Mining	5.74E+02	5.68E+02	6.28E+00
Construction	1.30E+04	1.31E+04	-3.67E+01
Manufacturing	4.76E+04	4.77E+04	-6.24E+01
Services	7.09E+04	7.09E+04	-2.06E+01
Other	9.69E+04	9.69E+04	-1.58E+01
Total	2.45E+05	2.45E+05	-1.36E+02

Table A.5. Final Demands for the Climate Change Action Plan Analysis (1990 Dollar Values in Millions, Deflator, and 1982 Dollar Values in Millions.)

No.	Industry description	Base	CCAP	Diff	Deflator	Deflated FD, 2000		
						Base	CCAP	Diff
1	Livestock and livestock products	4793.43	4794.83	-1.40	1.07	4459.84	4461.14	-1.30
2	Other agricultural products	41867.98	41877.08	-9.10	1.18	35505.41	35513.13	-7.72
3	Forestry and fishery products	-2106.40	-2109.10	2.70	1.32	-1598.66	-1600.71	2.05
4	Agricultural, forestry, and fishery services	1544.02	1548.02	-4.00	1.20	1281.99	1285.31	-3.32
5	Iron and ferroalloy ore mining	-472.20	-472.20	0.00	0.92	-515.78	-515.78	0.00
6	Nonferrous metal ore mining	-63.90	-59.00	-4.90	0.92	-69.80	-64.44	-5.35
7	Coal mining	5363.75	5316.95	46.80	0.82	6551.71	6494.54	57.17
8	Crude petroleum and natural gas	-41222.60	-41222.60	0.00	0.72	-63147.37	-63147.37	0.00
9	Stone and clay mining and quarrying	-215.60	-215.90	0.30	1.18	-183.47	-183.73	0.26
10	Chemical and fertilizer mineral mining	-2.40	-1.60	-0.80	1.18	-2.04	-1.36	-0.68
11	New construction	512510.15	514858.55	-2348.40	1.21	423492.11	425432.61	-1940.51
12	Maintenance and repair construction	60522.28	60633.18	-110.90	1.24	48643.53	48732.66	-89.13
13	Ordinance and accessories	23217.83	23171.63	46.20	1.10	21189.95	21147.78	42.16
14	Food and kindred products	249208.18	249278.98	-70.80	1.22	203451.85	203509.66	-57.80
15	Tobacco	20723.17	20726.57	-3.40	2.08	9985.15	9986.78	-1.64
16	Broad and narrow fabrics	598.48	599.38	-0.90	1.14	525.90	526.69	-0.79
17	Misc. textiles and flooring	8410.83	8440.53	-29.70	1.17	7192.43	7217.83	-25.40
18	Apparel	52395.53	52415.03	-19.50	1.15	45676.51	45693.51	-17.00
19	Misc. fabricated textiles	10619.60	10626.40	-6.80	1.11	9560.31	9566.43	-6.12
20	Lumber and wood products	1410.62	1415.32	-4.70	1.32	1070.93	1074.49	-3.57
21	Wood containers	84.68	84.68	0.00	1.21	70.23	70.23	0.00
22	Household furniture	21587.74	21693.14	-105.40	1.25	17253.62	17337.86	-84.24
23	Other furniture and fixtures	24570.68	24689.28	-118.60	1.32	18635.33	18725.28	-89.95
24	Paper and allied products	21213.15	21015.65	197.50	1.32	16092.52	15942.69	149.83
25	Paperboard containers and boxes	1839.91	1840.61	-0.70	1.32	1396.52	1397.05	-0.53
26	Printing and publishing	41592.93	41633.63	-40.70	1.44	28833.92	28862.13	-28.21
27	Chemicals and selected products	16188.23	16199.13	-10.90	1.15	14060.82	14070.29	-9.47
28	Plastics and synthetic materials	8948.05	8948.05	0.00	1.22	7356.18	7356.18	0.00
29	Drugs, cleaning and toilet preparations	70455.57	70485.87	-30.30	1.39	50603.73	50625.49	-21.76
30	Paints and allied products	1457.19	1458.69	-1.50	1.28	1140.66	1141.83	-1.17
31	Petroleum refining industries	58993.81	56237.31	2756.50	0.79	74911.82	71411.55	3500.27
32	Rubber and misc. plastics	13402.52	13411.32	-8.80	1.17	11468.87	11476.40	-7.53
33	Leather tanning and finishing	10.41	30.81	-20.40	1.44	7.24	21.44	-14.20
34	Footwear and other leather products	1829.71	1834.71	-5.00	1.35	1354.54	1358.24	-3.70
35	Glass and glass products	2702.98	2718.58	-15.60	1.19	2266.08	2279.15	-13.08
36	Stone and clay products	1732.65	1743.45	-10.80	1.15	1509.14	1518.55	-9.41
37	Primary iron and steel mfg	-9043.92	-9044.02	0.10	1.18	-7636.51	-7636.60	0.08
38	Primary nonferrous metal mfg	-1498.19	-1495.49	-2.70	1.33	-1129.43	-1127.40	-2.04
39	Metal containers	357.30	357.70	-0.40	1.12	318.34	318.69	-0.36
40	Fabricated structural metal products	7922.64	7947.14	-24.50	1.21	6525.52	6545.70	-20.18

Table A.5. (contd)

No.	Industry description	Base	CCAP	Diff	Deflator	Deflated FD, 2000		
						Base	CCAP	Diff
41	Screw machine products and stampings	5232.25	5231.65	0.60	1.18	4420.62	4420.11	0.51
42	Other fabricated metal products	6490.94	6537.54	-46.60	1.25	5210.26	5247.67	-37.41
43	Engines and turbines	9812.06	9825.56	-13.50	1.25	7869.79	7880.62	-10.83
44	Farm and garden machinery	18562.49	18641.79	-79.30	1.21	15297.92	15363.27	-65.35
45	Construction and mining machinery	22992.41	23052.81	-60.40	1.16	19752.93	19804.82	-51.89
46	Materials handling machinery and eq.	7769.14	7800.54	-31.40	1.16	6718.97	6746.12	-27.16
47	Metalworking machinery and equipment	4851.28	4944.48	-93.20	1.22	3981.36	4057.85	-76.49
48	Special industry machinery and eq.	21071.27	21154.97	-83.70	1.30	16223.64	16288.09	-64.44
49	General industrial machinery and eq.	37848.29	37922.59	-74.30	1.24	30633.98	30694.12	-60.14
50	Misc. machinery except electrical	2060.26	2061.26	-1.00	1.22	1690.26	1691.08	-0.82
51	Office, computing, and accounting eq.	161818.93	162165.33	-346.40	0.46	353108.28	353864.17	-755.89
52	Service industry machines	16141.20	16205.40	-64.20	1.23	13164.67	13217.03	-52.36
53	Electric industrial eq and apparatus	10394.19	10507.69	-113.50	1.23	8438.21	8530.35	-92.14
54	Household appliances	18686.25	18757.95	-71.70	1.14	16459.30	16522.46	-63.16
55	Electric lighting and wiring equipment	3619.18	3632.88	-13.70	1.27	2846.39	2857.16	-10.77
56	Radio, TV, and communications eq.	35124.02	35521.32	-397.30	1.10	32012.41	32374.51	-362.10
57	Electronic components and accessories	4740.89	4608.39	132.50	1.05	4533.26	4406.57	126.70
58	Misc. electrical machinery and supplies	25372.86	25432.56	-59.70	1.10	22995.16	23049.27	-54.11
59	Motor vehicles and equipment	185378.92	185670.22	-291.30	1.17	158389.37	158638.26	-248.89
60	Aircraft and parts	107893.63	107916.03	-22.40	1.21	88874.49	88892.94	-18.45
61	Other transportation equipment	27720.35	27800.75	-80.40	1.26	22070.35	22134.36	-64.01
62	Scientific and controlling instruments	78954.08	79047.98	-93.90	1.21	65245.91	65323.51	-77.60
63	Optical, ophthalmic, and photographic eq.	19736.75	19827.15	-90.40	1.11	17709.06	17790.17	-81.11
64	Miscellaneous manufacturing	25368.01	25421.51	-53.50	1.20	21152.34	21196.95	-44.61
65	Transportation and warehousing	178391.72	178466.72	-75.00	1.23	145128.31	145189.33	-61.02
66	Communications, except radio and TV	119583.31	119729.31	-146.00	1.34	89227.95	89336.89	-108.94
67	Radio and TV broadcasting	19559.21	19559.41	-0.20	1.44	13583.73	13583.87	-0.14
68	Electric, gas, water, and sanitary services	142219.80	138416.40	3803.40	1.15	124057.75	120740.06	3317.69
69	Trade	925122.29	926096.49	-974.20	1.20	771128.03	771940.06	-812.04
70	Finance and insurance services	306537.50	306620.10	-82.60	1.46	210562.92	210619.66	-56.74
71	Real estate	575473.37	575880.27	-406.90	1.48	388439.67	388714.32	-274.65
72	Hotel and lodging services	95509.66	95535.06	-25.40	1.50	63736.84	63753.79	-16.95
73	Business services	172884.08	172927.28	-43.20	1.53	113181.07	113209.35	-28.28
74	Eating and drinking places	181197.35	181202.25	-4.90	1.34	135211.81	135215.47	-3.66
75	Automobile repair services	107780.05	107799.55	-19.50	1.39	77612.19	77626.23	-14.04
76	Amusements	59774.54	59786.74	-12.20	1.42	42097.71	42106.30	-8.59
77	Health, education, and social services	740963.98	741166.88	-202.90	1.53	483594.82	483727.24	-132.42
78	Federal government enterprise	11354.57	11361.37	-6.80	1.34	8484.96	8490.04	-5.08

Table A.5. (contd)

No.	Industry description	Base	CCAP	Diff	Deflator	Deflated FD, 2000		
						Base	CCAP	Diff
79	State and local government enterprise	19623.23	19626.13	-2.90	1.48	13302.98	13304.95	-1.97
80	Noncomparable imports	-41844.00	-41860.70	16.70	0.00	0.00	0.00	0.00
81	Scrap	-18255.30	-18255.30	0.00	0.00	0.00	0.00	0.00
82	Government industry	567003.99	567003.99	0.00	1.49	380974.26	380974.26	0.00
83	Rest of the world industry	0.20	0.20	0.00	0.00	0.00	0.00	0.00
84	Household industry	0.00	0.00	0.00	1.10	0.00	0.00	0.00
85	Inventory valuation adjustment	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	TOTALS	6253970	6254162.8	-192.8		4997233.6	4996347.3	886.3199

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