DOE/AL/64506--961

The Economic Impact of the Department of Energy on the State of New Mexico Fiscal Year 1995

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August 1996

PREFACE

The Albuquerque Operations Office (AL) of the U.S. Department of Energy (DOE) is charged with managing laboratories, production plants, and energy programs in several locations throughout the United States, including New Mexico. Because of the significance of DOE activities in New Mexico, selected economic impact studies have been completed annually since the early 1980s. The types of activities that DOE/AL oversees are, for the most part, an outgrowth of atomic research that started in New Mexico in the 1940s. In New Mexico, activity that was once confined to "the Hill" (Los Alamos National Laboratory), northwest of Santa Fe, has become two national laboratories, a biomedical and environmental research institute; a national waste repository, a national remedial action project, and several energy research and conservation programs.

The economic impact on New Mexico has grown over the years to a point where these activities provide tens of thousands of jobs and contribute billions of dollars to the state's economy. Therefore, it is appropriate that a report be provided periodically to the citizens of New Mexico describing the impact of DOE on the state. This report details activities for federal Fiscal Year 1995. A glossary of terms is located prior to the reference list.

ACKNOWLEDGMENTS

As is the case with studies of this type, many more people contribute to the effort than just the listed authors. The detailed information needed for the economic modeling and expenditure analysis could not have been obtained without the support of several individuals. Moreover, there are some who contribute but their contributions are not always acknowledged—to those individuals, we apologize.

The employment data by economic sector used in the regional model was obtained from the New Mexico Department of Labor (NMSOL). Larry Blackwell, Chief, Economic Research and Analysis Bureau, NMDOL, made certain we obtained the detailed, but unpublished, data needed for our research. Steve Pazand, Unit Supervisor, Actuarial Research, NMDOL also assisted the study team in obtaining the appropriate data. Importantly, this state government department has cooperated fully with our research efforts for several years and should be commended for their continuing efforts to participate in regional economic studies.

Janet M. Smith, Staff Accountant, Albuquerque Financial Service Center, Department of Energy (DOE) Albuquerque Operations Office, contacted all the DOE agencies to obtain expenditure information for this study. From each of the DOE-integrated contractor and DOE operations offices, we thank the budget officials who provided budget and expenditure data in a timely fashion.

Technology Transfer offices at both Sandia National Laboratories and Los Alamos National Laboratory specifically Donna Rix and John Mott, supplied much of the text concerning annual achievements of their respective laboratories. Bruce Dale, Executive Policy Support, SNL, also provided summarized achievement information for SNL. Jim Porter and Rita Spencer, Quality and Planning Office, provided summarized achievement information for LANL. Ralph Bonner, Rosemary Dunivan, Gary Concannon, Carol Spencer, and Pam Ramsey from SNL and Newby Ellington and Randy Hodges from LANL supplied expenditure data. Data was also supplied by various individuals from the Waste Isolation Pilot Plant, Inhalation Toxicology Research Institute, Uranium Mill Tailings Remedial Action Project, National Atomic Museum, Ross Aviation, and the Central Training Academy.

Tommie Nielsen, Reports Layout Typist, Department of Agricultural Economics and Agricultural Business, New Mexico State University, typed several drafts, the final report, and assured that study information was transmitted among the authors.

DISCLAIMER

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

The U.S. Department of Energy (DOE) contributes substantially to the New Mexico economy. Economic benefits arising from the various activities and functions of the Department, mainly the Albuquerque Operations Office (AL) and its contractors, have accrued to the state on a continuing basis for about 50 years. DOE facility locations in New Mexico are shown in Figure 1.

DOE provided funding of just under $3.0 billion in Fiscal Year (FY) 1995 for its New Mexico offices and contractors. This also includes grants, community assistance, and expenditures by out-of-state DOE offices and DOE Headquarters. Econometric modeling techniques were used to estimate indirect and induced effects of this funding. The reference periods for these statistics are FY 1994 (October 1, 1993, through September 30, 1994) and FY 1995 (October 1, 1994, through September 30, 1995). Total impacts represent direct, indirect, and induced effects. The multipliers used to determine impacts result from the inter-industry, input-output (I/O) models developed jointly by economists at the DOE/AL and New Mexico State University (NMSU).

As Table 1 indicates, the total economic activity resulting from this initial infusion of $3.0 billion in New Mexico for FY 1995 was $9.7 billion. The total personal income impact was $2.7 billion. The DOE employment for FY 1995 was 21,307 and the indirect and induced effect was 54,754 jobs for a total impact of 76,061 jobs.

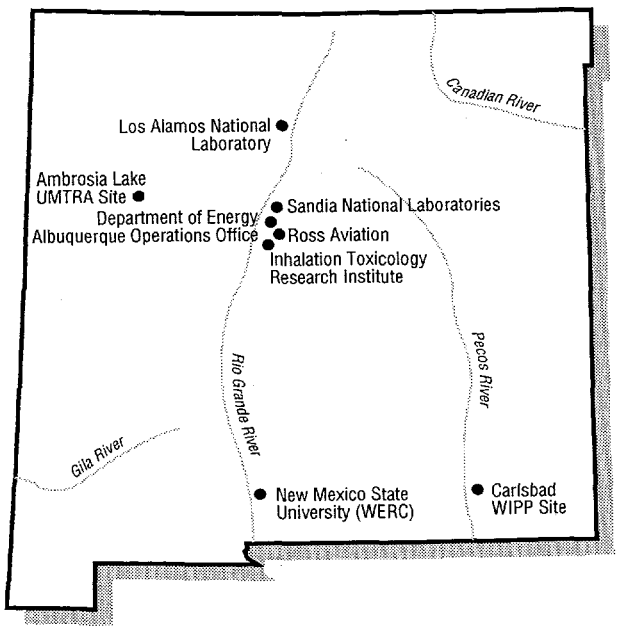


Figure 1. DOE Facilities in New Mexico.

As Table 2 indicates, from the FY 1995 funding of $3.0 billion, DOE/New Mexico in-state organizations and activities spent about $2.1 billion in FY 1995 for salaries and wages, materials and services, capital equipment, and construction in New Mexico. Out-of-state purchases and salaries for those living elsewhere amounted to over $913 million. The employment figure of 21,307 includes major on-site subcontractor data for both Los Alamos (LANL) and Sandia National Laboratories (SNL).

In FY 1994, the total impact of DOE on the state was greater than in 1995. Also, in 1994 the economic activity resulting from the initial infusion of $3.0 billion in New Mexico was $10.5 billion (Table 1). The total personal income impact was $2.9 billion. The DOE employment for FY 1994 was 21,762 and the indirect and induced effect was 61,673 jobs, for a total impact of 83,435 jobs in FY 1994.

Over the past few years, DOE/New Mexico expenditures increased each year from FY 1982 through FY 1990. Expenditures then decreased

Table 1. DOE/New Mexico's Influence on New Mexico's Economy, FY 1995.

Economic Measure	Revised FY 1994 DOE	FY 1995 DOE	FY 1995 Total State	FY 1995 DOE as a % of State
		---billions of dollars--		%
Economic Activity				
Direct Expenditures	3.04	2.97		
Indirect and Induced (a)	7.45	6.70		
Total	10.49	9.67	84.6	11.4
Economic Activity Multiplier	3.45	3.25		
Personal Income				
Gross Labor Costs	1.23	1.27		
Net Wages and Salaries	1.16	1.17		
Indirect and Induced (a)	1.75	1.56		
Total	2.91	2.73	30.4 (b)	8.9
Personal Income Multiplier	2.51	2.34		
		------number of employees-----		
Employment				
Direct	21,762	21,307		
Indirect and Induced (a)	61,673	54,754		
Total	83,435	76,061	738,440 (c)	10.3
Employment Multiplier	3.83	3.57		

Numbers may not add due to rounding.

(a) FY 1994 results based on the FY 1995 econometric model.

(b) April 27, 1995 wire release, Bureau of Economic Analysis, U.S. Department of Commerce, Washington, D.C.

(c) New Mexico Department of Labor, Economic Research and Analysis Bureau, Table C, April 1996.

Table 2. DOE/New Mexico Funding, Instate Expenditures and Employment by Major Entity in New Mexico, FY 1995.

Entity	1995 New Mexico Funding	1995 Instate Expend-itures	1995 New Mexico Employ-ment
	---millions of dollars---		(jobs)
Lockheed Martin (SNL)	1,459.4	900.1	8,153
Univ. of California (LANL)	1,184.9	763.5	8,558
US DOE Albuquerque Operations Office	129.0	128.1	1,133
Johnson Controls (LANL)	(a)	86.0	1,524
Westinghouse Electric Corporation (WIPP)	78.3	52.0	665
PT-LA	(a)	25.9	439
US DOE Nevada Operations Office	9.7	8.6	98
US DOE Idaho Operations Office	4.2	4.2	
Ross Aviation Inc	15.4	9.2	127
Jacob's Engineering Group. Inc (UMTRA)	14.6	12.2	62
Lovelace Medical Foundation (ITRI)	17.4	13.8	177
Allied Signal	18.5	16.8	267
Other Contractors New Mexico	5.7	5.7	9
M-K Ferguson Company Inc (UMTRA)	6.2	6.2	86
US DOE Oak Ridge Operations Office	6.8	4.3	8
Other US DOE Operations Offices	22.7	22.7	—
TOTAL	2,972.8	2,059.4	21,307

Numbers may not add due to rounding.

Note: For certain organizations, employment includes part-time people a full-time equivalents; in other words, two persons who work twenty hours a week are counted as one employee.

(a) Total Operating and Capital Budget for Johnson Control & Protection Technology -- Los Alamos is included in the LANL budget.

slightly in FY 1991, rose again from FY 1992 through FY 1994 and then decreased slightly in FY 1995 (Figure 2). This upward trend may has now leveled and the future funding levels will depend on national needs for the types of research and development carried out at the two national laboratories and other variables related to Congressional budget decisions. The past long term increases shown in Figure 2 also highlight the ability of New Mexico's infrastructure and business community to meet the needs of the laboratories with local products and services.

The decreasing percentages of DOE impacts relative to the state economy results from two basic factors: 1) the amount of funding to New Mexico through DOE is leveling; and 2) the overall state economy is continuing to grow making DOE's contribution a lesser part.

Caution should be exercised when comparing economic impacts between fiscal years prior to FY 1993 because two different I/O base models were used to estimate the impacts. New technical information was released by the Bureau of Economic Analysis (BEA), U.S. Department of Commerce in 1991 and in 1994 and was incorporated in FY 1991, FY 1993, and FY 1994 I/O models. Also in 1993, the state and local tax coefficients and expenditure patterns were updated from a 1986 study for the FY 1992 report.

The economic data support the following conclusions:

- DOE/New Mexico funding accounts for about 30 percent of all federal expenditures in New Mexico.
- The total economic impact of DOE's New Mexico funding of $3.0 billion was $9.7 billion in FY 1995. This is over 11 percent of the state's economic activity or more than one of every nine dollars of economic activity statewide. The FY 1994 impact was $10.5 billion, based on $3.0 billion in operating and capital budgets for DOE's operations in New Mexico. The FY 1994

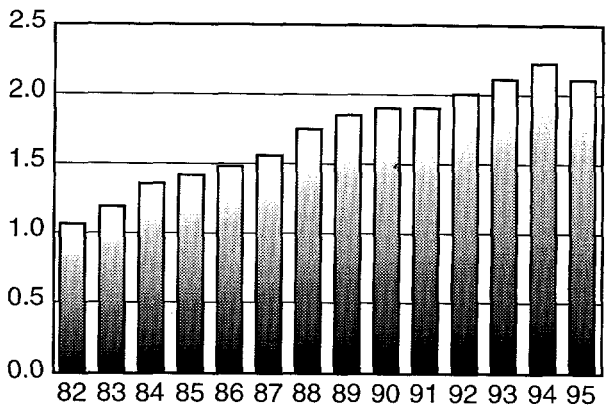
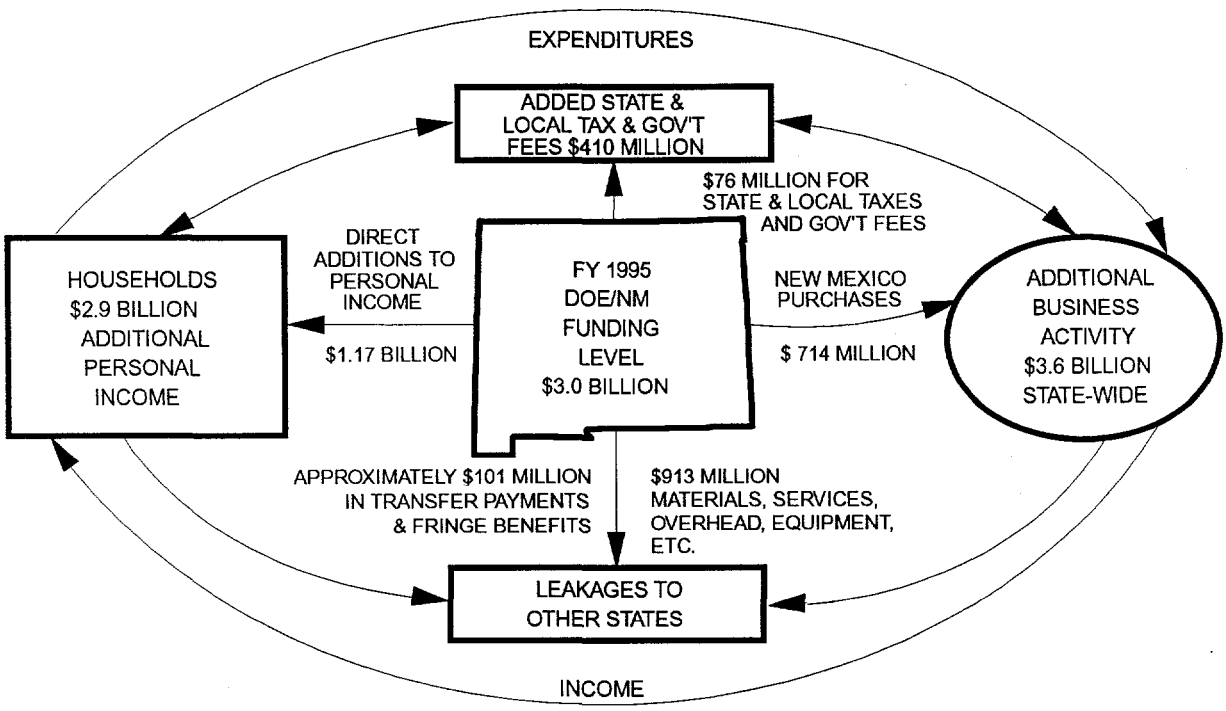


Figure 2. DOE Expenditures in New Mexico, FY 1982-1995.

impact was about 13 percent of the total economic activity in the state.

- In FY 1995, DOE federal and contractor-operated facilities and projects in New Mexico expended just under $3.0 billion. About $2.1 billion, or over two of every three dollars, were spent in-state.
- In FY 1995, expenditures in New Mexico had a 3.25 multiplier effect on the statewide economy. For every $100 expended by DOE, another $225 of additional economic activity was generated.
- DOE/New Mexico funding of $3.0 billion is equivalent to $1,800 for each resident. The direct spending in New Mexico of $2.2 billion is equivalent to $1,300 for each resident.
- DOE operations statewide directly added over $1.1 billion to total personal income in 1995 (Figure 3). The income multiplier effect generated nearly $1.6 billion additional personal income for a total impact of slightly over $2.7 billion, or just about 9 percent of the estimated $30.4 billion from all sources statewide. In short, about one of every $11 in personal income generated in the state is directly or indirectly attributable to DOE activities.
- Total DOE/New Mexico direct employment in 1995 was 21,307 jobs, resulting in a statewide impact of just over 76,000 jobs. Due to the multiplier effect of 3.57, another 257 additional jobs were supported for each 100 direct DOE/NM jobs. Total jobs supported are over 10 percent of all employment or one of every nine jobs in the state. In FY 1994, the statewide impact on employment was about 83,435 jobs using an employment multiplier of 3.57.
- DOE facility and project contractors paid nearly $76 million in taxes, fees, and enterprise charges to mainly state and local government entities. Total revenue effects (state and local), as a result of DOE operations accounted for $410 million in revenues from government taxes, fees, and



Total State-Wide Economic Impact -- $9.7 Billion

Figure 3. DOE Economic Impact on New Mexico, FY 1995.

enterprise charges (Figure 3). DOE offices and contractors spent about $714 million for goods and services (including construction) in New Mexico for FY 1995. These expenditures generated business activity of about $3.6 billion (Figure 3).

- Personal income in the state of New Mexico was increased about $2.7 billion in FY 1995 as a result of DOE operations.

INTRODUCTION

The U.S. Department of Energy (DOE) provides a major source of economic benefits in New Mexico, second only to the activities of the U.S. Department of Defense. The agency's far-reaching economic influence within the state is the focus of this report. Economic benefits arising from the various activities and functions of both the Department and its contractors have accrued to the state continuously for over 45 years.

For several years, DOE/Albuquerque Operations Office (AL) and New Mexico State University (NMSU) have maintained inter-industry, input-output modeling capabilities to assess DOE's impacts on the state of New Mexico and the other substate regions most directly impacted by DOE activities. One of the major uses of input-output techniques is to assess the effects of developments initiated outside the economy such as federal DOE monies that flow into the state, on an economy.

The information on which the models are based is updated periodically to ensure the most accurate depiction possible of the economy for the period of reference. For this report, the reference periods are Fiscal Year (FY) 1994 (October 1, 1993, through September 30, 1994) and FY 1995 (October 1, 1994, through September 30, 1995). Total impact represents both direct and indirect impacts (respending by business), including induced (respending by households) effects. The standard multipliers used in determining impacts result from the inter-industry, input-output models uniquely developed for New Mexico.

The results of the econometric input-output (I/O) model for FY 1995 are not directly comparable to results of the DOE/NMSU I/O model prior to FY 1994, as a new I/O model was developed to estimate economic impacts for FY 1995. The model was based on new technical information released by the Bureau of Economic Analysis (BEA), U.S. Department of Commerce. The revised FY 1994 and FY 1995 I/O models have a base year of 1987 and the economic sectors were restructured to reflect economic activity in the state of New Mexico better. In previous years the economic impacts had a base year of 1982 (see Adcock and Lansford 1991- 1992 and Lansford et al. 1994-1995).

The DOE/NMSU I/O model effective tax rates were updated to FY 1992. The updated local and state tax coefficients more accurately reflect the current effective tax rates for state and local governments in New Mexico. Numerous tax laws have changed since 1986. At the same time, local and state government expenditure patterns were examined and new direct coefficients were estimated by sector for local and state governments.

As a consequence of these revisions, the results reported by Adcock et al. for FY 1991 (1992) are not comparable with the post-FY 1992 results.

This report includes seven main sections: (1) Introduction; (2) Profile of DOE Activities in New Mexico; (3) DOE Expenditure Patterns; (4) Measuring DOE/New Mexico's Economic Impact; (5) Technology Transfer within the federal labs funded by DOE/New Mexico; (6) Glossary of Terms; and (7) Technical Appendix containing a description of the model.

PROFILE OF DOE ACTIVITIES IN NEW MEXICO

Albuquerque Operations Office

In FY 1995, AL was the largest of the eight DOE operations offices. Although some of the current AL activities can be traced to 1943 and the Manhattan Engineer District operations at Los Alamos, civilian control was established in 1946 through the DOE predecessor, the Atomic Energy Commission (AEC). For nearly 50 years the DOE and its predecessor agencies, the AEC and the Energy Research and Development Administration, have been an important economic activity in the state. The current AL Headquarters complex is located on Kirtland Air Force Base (KAFB), Albuquerque, New Mexico, as the result of a move from Los Alamos in April 1956.

The missions of DOE and AL have increased over the years and continue to change with new arms control treaties and increased emphasis on solving problems of national concern. However, as was the case in 1946, the predominant function of AL is the design, development, production, maintenance, and retirement of the nation's nuclear weapons. Performing this mission and other assigned missions in a safe and environmentally acceptable manner is a primary concern to AL and its contractors.

In addition to AL's nuclear weapons role in national defense, the operations office is also responsible for various non-weapons activities such as extensive

energy and environmental research programs, toxicology research, selected energy conservation efforts, the Waste Isolation Pilot Plant (WIPP), and the nationwide Uranium Mill Tailings Remedial Action (UMTRA) Project.

AL had a staff of about 1,555 in FY 1995, 1,133 of these were located in New Mexico. The remaining out-of-state employees were located in three area offices, one project office, and two transportation safeguard sections. AL is responsible for selected DOE operations in Colorado, California, Florida, Missouri, Tennessee, and Texas. AL also has activities in Utah, Arizona, Nevada, and South Carolina, but does not maintain an official office in these states. Facilities for which AL is responsible include two major laboratories, three production plants, a training academy, and a test site, Tonopah Test Range (TTR). TTR is located in Nevada and operated through Sandia National Laboratories. Nationwide, AL and its operating contractors employ approximately 25,255 people.

AL's integrated management and operating (M&O) contractors include the University of California (LANL), Lockheed Martin (SNL)[1], Lockheed Martin Specialty Components, Inc. (Pinellas Plant-Florida), Mason and Hanger-Silas Mason Co., Inc. (Pantex Plant near Amarillo, Texas), and Allied Signal (Kansas City Plant-Missouri). Other major contractors include: Westinghouse Electric Corporation (WIPP); Jacobs Engineering and MK Ferguson (UMTRA Project); Lovelace Biomedical and Environmental Research Institute (ITRI); Chem-Nuclear GeoTech, Grand Junction Projects Office; and Ross Aviation, air transportation services. Most of the facilities and projects for which AL is responsible are located in New Mexico.

Los Alamos National Laboratory

History

Los Alamos National Laboratory was established in 1943 as Project Y of the Manhattan Engineering District with the specific responsibility of developing the first nuclear weapon. It became a multi-discipline, multiprogram laboratory applying its capabilities to national needs, defense and civilian, during the cold-war era.

[1]Martin Marietta is now known as Lockheed Martin Incorporated.

Background

The Laboratory is located in Los Alamos County, New Mexico. The county covers 110 square miles and had a 1994 population of 18,521 (Bureau of the Census, 1994). The Laboratory is operated by the University of California for the U.S. Department of Energy under Contract W-7406-ENG-36, and is an affirmative action/equal opportunity employer.

In FY 1995, the Laboratory had 8,558 University of California employees; 1,533 of whom had a doctorate and 3,303 of whom had at least one technical degree. The operating budget was approximately $1.2 billion.

Administrative, research, and maintenance facilities occupy more than 7.8 million square feet of building space, with 2.3 percent being leased (off site). The 34 technical areas are scattered over 43 square miles and occupy about 39 percent of the total county area.

Los Alamos is involved in partnerships and collaborations with other federal agencies, universities, and industry. Working with a broad spectrum of partners reflects the fact that the Los Alamos National Laboratory is a national laboratory.

Mission and Capabilities

The Laboratory's central mission is reducing the global nuclear danger, which involves five areas: Stockpile Stewardship, Stockpile Support, Nuclear Materials Management, Non Proliferation and Counter Proliferation, and Environmental Stewardship. A distinguishing feature of the Laboratory is its work in nuclear science. It is responsible for maintaining the safety and operability of the physics package of the nuclear weapons. Los Alamos also applies its expertise to key conventional defense and civilian issues that are synergistic with the central mission and capabilities.

Los Alamos provides technical assistance to the weapons complex and provides support to such areas as energy and environmental technologies. It also emphasizes basic research that sustains existing programs and the DOE research mission, work for other federal agencies, and work with U.S. industry.

The Laboratory's technical capabilities are clustered into eight major areas called core technical competencies. The core competencies are characterized by those that emphasize a scientific approach and those that emphasize scientific foundations:

Scientific Approach

- Complex experimentation and measurement
- Theory, modeling, and high-performance computing
- Analysis and Assessment

Scientific Foundations

- Nuclear weapons, science, and technology
- Earth and environmental systems
- Nuclear and advanced materials
- Bioscience and biotechnology
- Nuclear science, plasmas, and beams

Major Facilities

- TA-55 Plutonium Facility. The nation's only full-service operating plutonium facility. Weapons stockpile stewardship, pit surveillance and dismantlement, actinide research, NASA fuel projects, nuclear waste management and treatment.
- Laboratory Data Communication Center (LDCC) plus Advanced Computing Laboratory (ACL). Laboratory's central computing facility plus state-of-the-art ACL for advances in high-performance computing.
- Neutron Science Center (LANSCE): National user-facility. Includes the Lujan Neutron Scattering Center, the Weapons Neutron Research facility, one of the world's most powerful proton linear accelerator, and the proton storage ring. LANSCE supports advanced materials science, nuclear science, partical beam technology, nuclear weapons science, bioscience, and chemistry.
- Chemistry & Metallurgy Research Facility (CMR). Plutonium metallurgy, advanced chemical diagnostics, nuclear and radiochemistry.
- Materials Science Laboratory (MSL). Materials R&D center and user facility, experiments in high-temperature superconductivity, materials modifications and analysis, using ion beams and lasers.
- Health Research Laboratory (HRL). Center for Human Genome Studies, biological research, molecular biology, biochemistry, genetics.

Achievements

- Developed first nuclear weapons (1945).
- Demonstrated the ignition of thermonuclear fuel (1951).
- Tested first thermonuclear weapon (1952).
- Designed the majority of the weapons in the nuclear stockpile and the first flash x-ray radiographic facility (1963) and holds responsibility for stewardship of the weapons.
- VELA satellite verification of atmospheric test-ban treaty (1963).
- Major contributions to the development of large scale computers and computation and to nuclear reactor design:

  MANIAC II computer (1956), IBM's STRETCH (1961), Cray computer (1976), Thinking Machines Corp. CM-2 (1989-90), Monte-Carlo method (1947) and the S_n discrete ordinates method (1953) for solving radiation transport computations, the particle-in-cell method of numerical fluid dynamics (1957), computer codes to analyze reactor safety (1979). Achievement of criticality: uranium solution-fueled reactor (1944);

  First plutonium-fueled reactor (1946); "Lady Godiva" critical assembly (1953); KIWI reactor (1960); and Phoebus reactor (1965); for nuclear-powered rocket program, and operation of UHTREX reactor (1969).

- Major contributions in fundamental science, including:

  Detection of neutrino (1956), first demonstration of thermonuclear plasma in laboratory fusion studies (1958), use of high intensity LAMPF proton accelerator for nuclear studies (1972), discovery of heavy-fermion superconductor (1982).

- Recent Contributions:

  Detection of single fluorescent molecules, first flow cytometer for sorting single biological cells, discovery of the human telomere, complete sequencing of chromosome 16, measurements of neutrino mass and observation of neutrino

oscillations, computer simulation of earth's magnetic field that predicts reversal of the field, computer modeling of global ocean temperatures. Detection of ionic pulsed-pairs of radio impulses by a detection instrument aboard a satellite, new milestones in high temperature superconductivity and materials processing.

Future Prospects

Los Alamos will continue its role in science-based stockpile stewardship. Although defense is expected to decrease; there may be an increase in the role in non-proliferation and counterproliferation. The Laboratory has been tentatively assigned, in the Stockpile Stewardship and Management Program Programmatic Impact Statement, as the preferred location to manufacture nuclear weapon pits on a small scale. It has also been named as the project office for activities relating to the accelerator-production of tritium.

Sandia National Laboratories

History

Sandia was established in 1949 to perform the engineering development and ordnance responsibilities associated with nuclear weapons. The facility evolved into an engineering research and development laboratory by the early 1960s. During the 1970s, it became a multiprogram national laboratory with responsibilities in national security, energy, and environmental research and development. Sandia National Laboratories is operated for the U.S. Department of Energy by Sandia Corporation, a Lockheed Martin company.

Background

Sandia's executive management offices and larger laboratory complex are located on Kirtland Air Force Base at the southeastern edge of Albuquerque, New Mexico. This site, referred to as Sandia/New Mexico, is composed of five technical areas and an expansive outdoor testing field covering 17,750 acres. This location benefits from its proximity to other major defense laboratories and testing facilities and the emerging high-technology industrial climate in the Rio Grande research corridor. Another Sandia complex in Livermore, California occupies 413 acres at the eastern edge of the San Francisco Bay area. Sandia also operates test facilities in Nevada and Hawaii. Approximately 8,000 people are employed by Sandia, and annual operating funding is over $1.4 billion.

Mission and Capabilities

Sandia is responsible for the engineering development of all U.S. nuclear weapons and for systems integration of the nuclear weapons with their delivery vehicles. National security programs and defense-related environmental programs for the Department of Energy constitute 65 percent of the laboratory's work. Responsibilities embrace the design, certification, and assessment of the non-nuclear subsystems of nuclear weapons; safety, security, reliability, and use-control; issues associated with the production and dismantlement of nuclear weapons; surveillance and support of weapons in stockpile; and substantial work in nuclear intelligence, nonproliferation, and treaty verification technologies. Ten percent of Sandia's work supports DOE missions in energy science, research, and development. When appropriate, the laboratory also performs work for other government agencies, particularly the Department of Defense, in programs where unique competencies, built from mission responsibilities, can add value.

Achievements

- Automated gas generator disassembly robotic workcell.
- MC4033 common radar fuze.
- Certification of the B-2A stealth bomber to carry the B61-7 and B83-0/1 nuclear bombs.
- Stockpile surveillance on hundreds of nuclear weapons.
- Initial production of molybdenum-99 for domestic medical requirements.
- Vertical-cavity surface-emitting laser with greater than 50 percent energy conversion efficiency.
- Monolithic fabrication process for micromachines.
- World computational speed record.

Future Prospects

Funding for defense programs is expected to stabilize or perhaps increase slightly as the laboratories move toward science-based stockpile stewardship in the absence of nuclear testing. The

technology transfer program has experienced recent reductions, and may experience further changes before stabilizing. Energy programs may experience some decline and change in emphasis in the coming years. Environmental cleanup activities will continue until 2000 with little change. In the future, Sandia will be increasingly focused on defense programs responsibilities and activities that support the core competencies for that mission.

Waste Isolation Pilot Plant

History

WIPP was authorized and funded by the U.S. DOE National Security and Military Applications of Nuclear Energy Authorization Act of 1980 or Public Law 96-164 as authorized by Congress, which provided for a research and development facility to demonstrate the safe disposal of radioactive wastes resulting from defense activities. The WIPP site was chosen through a selection process that started in the 1950s. DOE/AL was given the responsibility for managing the disposal of defense-generated transuranic (TRU) waste in a deep geological repository.

Construction of the surface structures and underground mines was completed, site data collected, and a Final Safety Analysis Report was published in 1990. The Land Withdrawal Act of 1992 identified the regulatory and institutional prerequisites for reaching a disposal decision. DOE established the Carlsbad Area Office (CAO) in 1993 to assume responsibility for the WIPP and the National Transuranic Program.

Background

WIPP is located 26 miles east of Carlsbad in Eddy County, New Mexico and fewer than 30 people live within a 10 miles radius of WIPP. The WIPP repository is an underground mine located 2,150 feet below the surface in the Salado Formation (Figure 4), a 2,000–foot thick salt bed that extends laterally for 36,000 square miles. The WIPP site covers 10,240 acres, of which 12 acres have been mined underground for conducting scientific experiments and another 15 acres mined for waste disposal. A total of 100 acres, in eight separate blocks, will be mined to hold waste. Approximately 250 surface acres are fenced and surrounded by a 10,000-acre buffer zone available for recreation use or grazing leases. WIPP is operated for DOE by Westinghouse Waste Isolation Division. During FY 1995, 952 WIPP-related jobs [including CAO, Westinghouse, SNL, and the CAO Technical Assistance Contractor (CTAC)] were in the Carlsbad area. The total CAO budget for FY 1995 was $181.2 million.

Mission and Capabilities

The mission of the CAO is to protect human health and the environment by providing for safe disposal of transuranic waste by establishing an effective system for management of transuranic waste from generation to disposal. The WIPP facility serves as a research and development facility to demonstrate the safe disposal of radioactive wastes resulting from U.S. defense activities and programs. The WIPP is exempted from regulation by the Nuclear Regulatory Commission. The WIPP facility will become a critical component for TRU waste disposal within the larger DOE vision to clean up the DOE Weapons Complex by the year 2019.

The decision to dispose of waste at WIPP will be made by the Secretary of Energy and is based on a thorough evaluation of repository and system performance, including; operational excellence, transportation, packaging, characterization, and certification. It will also be based on informed public participation and institutional and regulatory acceptance.

Achievements

During fiscal year 1995, the CAO and its contractors

- Provided a $300,000 planning grant to establish the Advanced Manufacturing and Innovation Training Center (AM & ITC) to serve the mining, manufacturing, and technology training needs identified by southeastern New Mexico business and industry. The AM&ITC will serve Eddy, Chavez, and Lea counties in southeastern New Mexico. Resources secured for the center included $1.96 million from the CAO for equipment and operating funds leveraged by $2 million provided by the Economic Development Administration for the facility construction. The New Mexico Legislature provided $500,000 for training and education, resulting in additional leveraging of the project. New Mexico State University-Carlsbad contracted to provide the education and training at the AM&ITC.
- Established the Southeastern New Mexico National Environmental Technology and Training Center (TTC) with a grant of

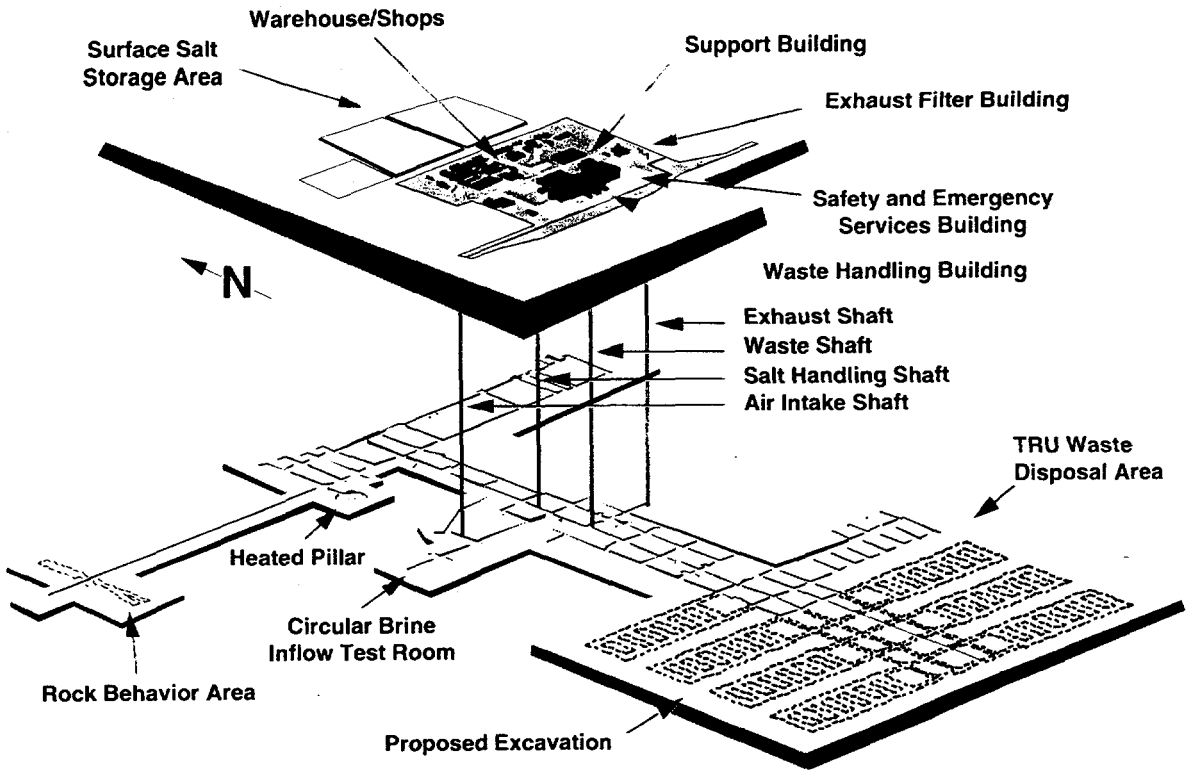


Figure 4. Waste Isolation Pilot Plant Layout.

$500,000. NMSU-C and Stoller Corporation contracted to provide the training and education at the TTC. The TTC will focus its efforts on the National TRU Program and Safe Worker Training for regional business and industry.

- Expanded the transfer of information and technology at an exponential rate to private business, education, governmental agencies, and nonprofit organizations as a result of entry into the Internet for offering DOE-funded technologies and reducing the process cycle time. The growth of technology transfer of CAO has increased the return on taxpayer dollars invested in these technologies. CAO received more than 1,400 requests for review copies of CAO information technology from U.S. and international organizations. Eighty-eight percent of respondents to an Internet survey about CAO technology transfer said the program is "definitely" an appropriate use of taxpayer dollars.

- Wrote three grants for area public school systems that earned a total of $62,000 to enhance educational opportunities for students in southeastern New Mexico. Supported development of college degree programs at two area universities. With curriculum design teams of regional stakeholders, the CAO assisted the College of the Southwest in establishing a bachelor's degree in environmental management in Carlsbad.

Future Prospects

- Complete integration of DOE-funded projects for southeastern New Mexico will be accomplished with construction of the AM&ITC facility; full implementation of AM&ITC education/training and business incubation; extensive TC training for the National TRU Program and safe worker training courses to regional businesses; acceleration of technology transs h exped the Internet to offer CAO-funded technology opportunities; and development of paperless technology transfer on the Internet.

Uranium Mill Tailings Remedial Action Project

History

The UMTRA Project was established by Public Law 95-604, "The Uranium Mill Tailings Radiation Control Act of 1978", and is mandated to stabilize and control the tailings in a safe and environmentally sound manner, in accordance with EPA standards.

Background

The UMTRA Project Office located in Albuquerque, New Mexico is managed by 21 federal employees. Technical assistance through engineering, environmental, regulatory compliance support and overall project management is provided by a team of companies led by Jacobs Engineering Group Inc. and teaming partners, Roy F. Weston, AGRA Earth and Environment, and Geraghty and Miller, Inc. In FY 1995, these companies had 119 people in New Mexico devoted to the nationwide project. Construction management support is provided by MK-Ferguson Company and subcontractors with staff of 583 employees. The former processing sites are near Shiprock and Ambrosia Lake, New Mexico; Salt Lake City, Green River, and Mexican Hat, Utah; Canonsburg, Pennsylvania; Durango, Slick Rock, Gunnison, Naturita, Grand Junction, Rifle, and Maybell, Colorado; Tuba City and Monument Valley, Arizona; Spook (Converse County) and Riverton, Wyoming; Lakeview, Oregon; Lowman, Idaho; Belfield and Bowman, North Dakota; and Falls City, Texas (Figure 5).

Mission and Capabilities

The DOE/AL has been assigned responsibility for managing this nationwide project. The work involves eliminating or minimizing potential health hazards from uranium decay products by providing remedial action at 24 inactive, privately owned, uranium mill tailings and processing sites and approximately 5,200 associated vicinity properties around the nation. Most of these sites met the requirements of the Atomic Energy Act of 1954 before abandonment, but do not meet standards proposed by the U.S. Environmental Protection Agency (EPA). The 1988 amendments to Public Law 95-604 directed the DOE to conduct cleanup of ground water resources affected by contamination from UMTRA Project sites.

Achievements

- In 1995, Vice President Al Gore presented the UMTRA Project with the National Performance c1 Review Hammer Award, for helping to reinvent government though an outstanding Cost Reduction/Productivity Improvement Program effort that has saved taxpayers more than $70 million since 1988.
- The UMTRA Project received the DOE "Quality Team Award," from Secretary of Energy Hazel O'Leary.

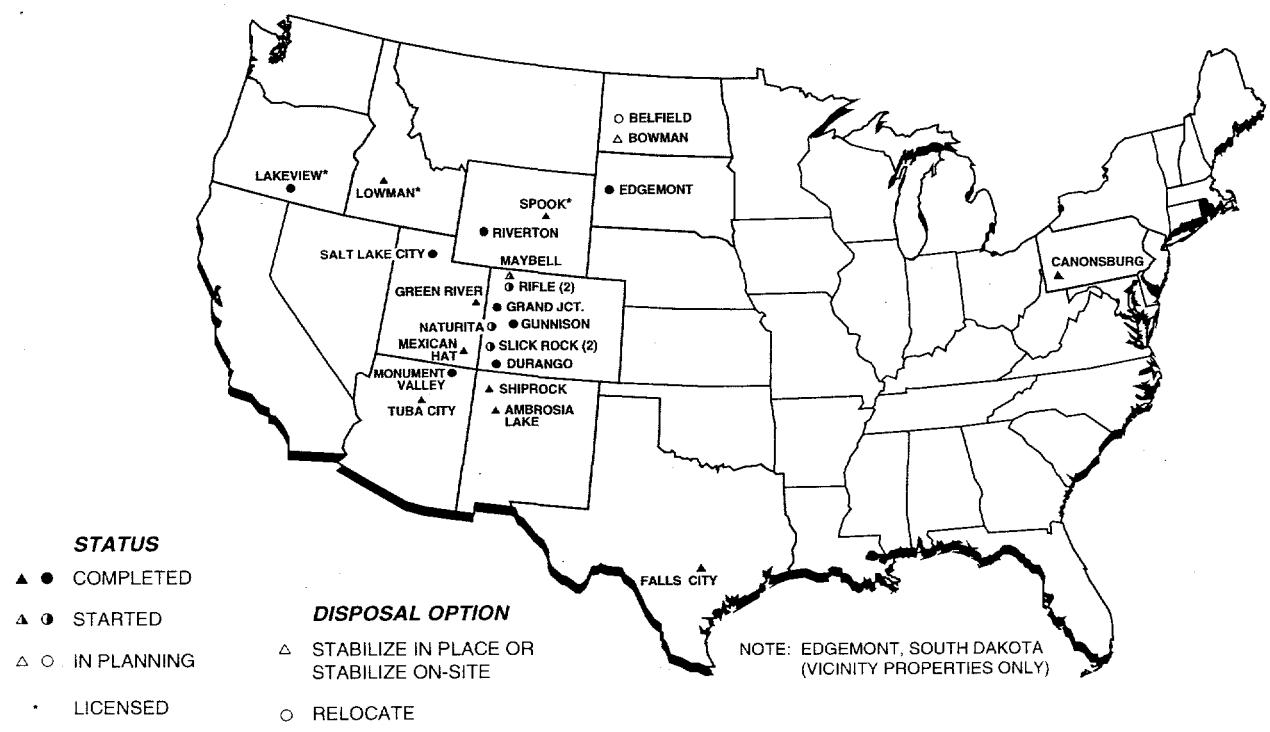


Figure 5. UMTRA Project Sites.

Surface Phase

- Uranium mill tailings have now been stabilized and isolated at 15 of the UMTRA Project sites: Canonsburg, Pennsylvania; Shiprock and Ambrosia Lake, New Mexico; Salt Lake City, Green River and Mexican Hat, Utah; Lakeview, Oregon; Tuba City, and Monument Valley, Arizona, Riverton and Spook, Wyoming; Durango and Grand Junction, Colorado; Lowman, Idaho; and Falls City, TX.
- Cleanup work is currently underway at seven sites: Gunnision, Rifle (two sites) Naturita, Slick Rock (two sites) and Maybell, Colorado.
- Obtained National Regulatory Commission (NRC) licensing of the Lakeview, Oregon, and Lowman, Idaho sites. Obtained NRC certification for the Riverton, Wyoming, site.

Ground Water Phase

- In FY 1991, funds were allocated to initiate planning for the ground water cleanup phase of the UMTRA Project. Sites will be evaluated to determine the need for ground water restoration. If it is determined ground water contamination exists at a site, strategies will be identified and implemented to bring ground water conditions into compliance with Environmental Protection Agency standards.
- The DOE prepared a draft Programmatic Environmental Impact Statement (PEIS) for the ground water project in compliance with the National Environmental Policy Act (NEPA). The PEIS presents ways to address ground water compliance at the former uranium mill sites.
- The total of 23 public meetings were held in late 1992 and early 1993 to inform the public about the ground water phase of the project and receive comments about the proposed compliance strategies.
- In 1995, DOE held nine public hearings and established a comments period to allow stakeholders a chance to comment on the document and planned approach.
- On October 1, 1995, the DOE transferred responsibility for the UMTRA Ground Water Project to the Grand Junction Projects Office in Grand Junction, CO.

Vicinity Properties

- An important aspect of the UMTRA project is the cleanup of residences, businesses, and open lands where uranium mill tailings were used as construction materials. These sites are called vicinity properties. Approximately 5,200 vicinity properties have been identified for cleanup. To date, more than 5,000 vicinity properties have been remediated by the UMTRA Project.

Future Prospects

Surface Phase

- In 1996, surface cleanup is scheduled to begin at Naturita, Colorado.
- Surface cleanup is scheduled to be completed in FY 1996 at Gunnison and Rifle (two sites), Colorado, bringing the total number of completed sites to 17.
- Surface cleanup is scheduled for Slick Rock (two sites) and Maybell, Colorado, in late 1996.

Ground Water Phase

- The programmatic Environmental Impact Statement for the ground water phase of the UMTRA Project is due to be completed in 1996.
- The final PEIS is scheduled for release in 1996.
- The Record of Decision will be published in mid-1996.

Other Areas

- An exciting aspect of the UMTRA Project is the opportunity for the international exchange of technical information in the future. DOE expertise is being sought in the cleanup of uranium mill tailings in developing democracies.

Inhalation Toxicology Research Institute

The Inhalation Toxicology Research Institute (ITRI) is a Federally Funded Research and Development

Center and a single-program laboratory of the Office of Health and Environmental Research, Office of Energy Research. ITRI serves as an international research resource for government and industry. The facilities are owned by the DOE and staffed and operated by the private, nonprofit Lovelace Biomedical and Environmental Research Institute, Inc., a subsidiary of The Lovelace Institutes.

ITRI is located on Kirtland Air Force Base East near Albuquerque, NM. On a 40-acre site, ITRI encompasses 290,000 square feet of laboratory, office, animal housing, clinical, and research support space. Facilities include a chronic exposure complex with laboratories suitable for study of carcinogenic materials, and an acute inhalation exposure facility for use with chemical toxicants and alpha-, beta-, and gamma-radionuclides. The staff of 170 includes approximately 30 doctoral-level investigators with expertise in aerosol science, molecular biology, toxicology, chemistry, pathology, immunology, physiology, and mathematics. Approximately 80 percent of the ITRI 1995 operating budget of $16 million is provided by DOE; the remaining research is supported by a variety of government and industry sponsors.

Mission and Capabilities

ITRI is dedicated to protecting human health by conducting basic and applied research to improve understanding of the respiratory tract and the health effects that might occur in humans from inhaling airborne toxicants in the home, workplace, or environment. The Institute's three-part mission includes research, education, and technology transfer. Its primary goals are to conduct high-quality, unbiased research and to link laboratory results with epidemiological findings in order to identify, define, and reduce human health risks. The Institute is oriented toward collaborating with other scientists, developing research partnerships with industry for problem solving and technology transfer, and serving the scientific community through advisory roles, leadership in professional societies, and research training.

Achievements

- Produced over 100 publications in FY-1995 reporting new information on the risks to human health from exposure to airborne toxic materials in the environment, home, and workplace.
- Developed new estimates of potential exposure of workers to inhaled radioactive particles in accident scenarios in DOE facilities.
- Developed and verified new estimates of deposition of inhaled particles and vapors in different regions of the respiratory tract.
- Identified and quantified enzymes in human and animal nasal tissue important in metabolizing inhaled toxic chemicals.
- Developed procedure for estimating past exposures to radon by measuring trace radioactivity of lead-210 in bone of living subjects.
- Demonstrated that a single inhalation of plutonium particles and chronic inhalation of cigarette smoke act synergistically to cause lung cancer in rats.
- Demonstrated that genetic markers of developing malignancy can be detected in lung cells recovered from sputum of former uranium miners and smokers.
- Determined that cells from humans indicate wide individual differences in susceptibility to genetic injury from radiation.
- Discovered that inhalation of solvent vapors can alter the tissue distribution and radiation dose from radioactive particles inhaled accidentally.
- Provided the first inhalation toxicity data on carbonyl sulfide, a chemical encountered in decommissioning a facility with contaminated pipes.
- Continued an active educational program for summer college and high school students, secondary school teachers, a joint graduate student program with UNM, and a postdoctoral program.

Future Prospects

- Continue to conduct studies to predict the health risks to humans from inhaled environmental and occupational pollutants.
- Continue to expand molecular and cellular studies in order to understand the basic mechanisms by which pollutants cause lung cancer and chronic lung disease.

Other DOE Activities in New Mexico

National Atomic Museum

The congressionally chartered National Atomic Museum is operated for the Department of Energy by Sandia National Laboratories. The museum's mission is to preserve and exhibit to the public the history of the nuclear age. Exhibits focus on nuclear defense but also include peacetime uses of nuclear energy and nuclear science. Tours are provided to organized groups on a scheduled basis. The museum also maintains a library and photographic archives. In calendar year 1995, 130,000 guests visited the museum.

Ross Aviation

Ross Aviation, Inc. is AL's management and operating contractor providing air cargo and passenger service. It utilizes base facilities located on KAFB, Albuquerque, New Mexico. All aircraft operated in support of the air service contract are government owned or leased. Services supported by Ross Aviation, Inc., include daily transport of passengers between Las Vegas and the Tonopah Test Range, Nevada. Ross also transports cargo between production plants, national laboratories, test sites, and military facilities and provides special passenger and cargo flights on demand. The AL fleet of aircraft is maintained by Ross Aviation under the provisions of its FAA repair station certification.

Ross Aviation, Inc. operates from a facility contiguous to the Albuquerque International Airport. The contractor employs approximately 85 people and has an annual operating budget of about $9 million. The AL fleet consists of three DC-9 jet transports, one Dash-7 turboprop STOL aircraft, two DHC-6 Twin Otter turboprop airplanes, one turboprop BE-B200 King Air, and one Lear 35A business jet. The size and mix of the fleet is adjusted in response to DOE mission requirements.

Security Training

The DOE Safeguards and Security Central Training Academy (S&SCTA) is operated by Wackenhut Services Incorporated (WSI) and is located on the old Manzano Base Administration Area of KAFB, Albuquerque, New Mexico. The mission of the S&SCTA is to provide standardized training to DOE and contractor personnel located throughout the country in all aspects of safeguards and security program management, information security, personnel security, nuclear materials control and accountability, and protection program operations.

S&SCTA is staffed by four DOE and 120 WSI contractor employees supplemented by Battelle Memorial Institute, a subcontractor to WSI. The Academy's curriculum includes 130 different courses, including 34 that have been approved for college level credit by the American Council on Education (ACE). Forty of the Academy's courses have been converted from traditional classroom formats to multi-media Distance Learning courses which can be exported to students at their individual work locations throughout the country. These multi-media training courses use a variety of delivery technologies including on-line computer networks, print and computer based CD-ROM software, audiovisual media including both video and audio cassettes, televideo-conferencing and state-of-the-art live interactive television. Use of these technologies allows the Academy to provide cost-effective, high quality, and timely training opportunities to safeguards and security personnel throughout the country. Through use of state-of-the-art technology with existing on-campus resources, the S&SCTA has the capacity to train an unlimited number of students virtually wherever they may reside, anywhere in the world.

The AL Transportation Safeguards Division conducts extensive training for Special Agents (Couriers) in a remote site on KAFB. The Transportation Safeguards Training Center (TSTC) utilizes two primary contractors (Essex, Corp. and AlliedSignal Inc.) to provide services. FY 1995 federal jobs for this program are approximately 15; contractors employ approximately 45.

Albuquerque Operations Office Support Contractors

In addition to the contractors that manage and operate the several facilities and projects for DOE in New Mexico, the Operations Office uses other contractors for technical, management and administrative support services. AL currently has over 30 support service contracts—60 percent are minority-owned small and disadvantaged businesses (commonly referred to as 8(a) firms). The FY 1995 expenditure for support services was approximately $72.0 million, which included management and operation of the DOE Safeguards and Security Central Training Academy. Major contractors supporting the New Mexico activities provide

specialized technical and management support, special studies, and analysis, training, medical services, facilities maintenance, custodial, and administrative services. Core areas supported include national security; science and technology management; environmental management; environmental, safety, and health; and business practices.

DOE EXPENDITURE PATTERNS

The term DOE/New Mexico is used to describe the funding to and expenditures of the AL, all the DOE/AL contractors, and other DOE offices expending money in the state. The type of model used was an I/O model, reflecting the fact that the model related the level of activity within an economic system to the level of demands for its outputs or products. Tables 3 and 4 are summaries of Appendix Tables 10, 11, 12 and 13. The expenditure patterns (production functions) of DOE in New Mexico, as shown in column 38 of Table 15, were derived as follows: New Mexico expenditures and operating budgets for FY 1994 (Table 3) and FY 1995 (Table 4) were collected from DOE contractors in New Mexico; for DOE contractors not in New Mexico, only amounts expended in New Mexico were collected; total expenditures in New Mexico during FY 1994 and FY 1995 were also collected from AL and other DOE operations offices.

Table 3. DOE NM Expenditures (in thousands of dollars) by Sector and Total Operating Budget, US DOE Offices and Total Expenditures, FY 1994.

	US DOE Albuquerque Field	(SNL)	LANL(c)	(WIPP)	UMTRA(f)	(ITRI)	Other Support Contractors(g)	Other DOE Offices(h)	Totals
1. Livestock & Livestock Products									
2. Other Agricultural Products			10	37					47
3. Forestry & Fishery Products									
4. Agric., Forestry & Fishery Services		367	27						393
5. Mining, Crude Petroleum & Natural Gas		3,030	1,296						4,327
6. Construction	6,316	126,199	8,556	1,088	362		55		142,576
7. Ordnance & Chemical Man.		111	47				14		173
8. Food & Kindred Products Man.			41						41
9. Textiles Products & Apparel Man.		121	84						206
10. Lumber & Wood Products Man.		119	345			1			465
11. Paper & Publishing Man.		1,870	265						2,134
12. Petroleum Refining & Products Man.		235		26			592		854
13. Glass, Stone & Clay Products Man.		23	734						758
14. Primary & Fabricated Metals Man.		3,889	3,084						6,973
15. Computer, Office & Service Equipment Man.		5,856	6						5,862
16. Electrical Equipment Man.		5,396	6,562	56					12,014
17. Scientific Instruments Man.		3,187	558				35	462	4,242
18. All Other Man.		270	6				12	353	640
19. Motor Freight Transportation & Warehousing		1	73	29		4		73	180
20. All Other Transportation		124	3,796	51			40	1,182	5,182
21. Communication	2,144	6,897	1,635	6	488	26	56	145	11,398
22. Electric & Gas Utilities	777	16,350	28,991	830	798	44	120	398	48,278
23. Water & Other Utilities	10	724	552	15		2	10	26	1,339
24. Wholesale Trade		37,552	67,939	2,985					108,476
25. Retail Trade	1,261	55,971	56,755	12	1,705	690	3,834	2,900	123,128
26. Finance, Insurance & Real Estate		434	996	4	9	689	50	1,143	3,326
27. Hotel Restaurant & Other Personal Services		58	1,161			42	103	878	2,241
28. Data Processing & Computer Services		43,983	13,302	1,480	162	43		101	59,070
29. Management & Consulting Services		54,621	15,009	11	109	97	1,115	10	70,971
30. Engineering, Architecture & Surveying Services		59,095	32,606	232	9	7,017	12	5,504	104,475
31. Other Business Services	17,290	73,598	27,315	3,909	1,306	202	1,974	900	126,494
32. Automobile & Other Repair Services		380	1,468	3	43	19	44	1,099	3,054
33. Amusement, Recreation & Video Services		124	208			52			383
34. Health, Education & Social Services		19,056	9,042	50	75	14	11	4,192	32,440
35. Government Services	3	1,753	3,105			44	523	308	5,735
36. Local Government	3,269	21,954	1,172	1,306	19	966	106	387	29,180
37. State Government	6,548	35,878	1,957	2,616	38	1,488	214	2,507	51,247
38. United States Department of Energy (a)									
39. Households	102,887	495,996	587,884	38,942	8,671	7,364	8,720	17,102	1,255,433
Total New Mexico Expenditures	104,507	900,038	876,586	53,686	13,793	18,806	17,639	39,640	2,223,746
Total Operating and Capital Budget	104,507	1,459,383	1,295,579	81,555	16,038	26,094	23,225	42,553	3,044,609

*Total may not add due to rounding

a. Any transfer money for services or products between specified activities is counted only in the activity of the last receiving agency.

b. Includes SNL.

c. Includes LANL, PT-LA, and Johnson Control.

d. Includes Westinghouse.

e. Includes only ITRI.

f. Includes Jacob's Engineering Group and M-K Ferguson Co.

g. Includes EG & G Rocky Flats, Ross Aviation and Other Contractors.

h. Includes Nevada, Oak Ridge and Other Operations Offices.

Table 4. DOE NM Expenditures (in thousands of dollars) by Sector and Total Operating Budget, US DOE Offices and Total Expenditures, FY 1995.

	US DOE Albuquerque Field	(SNL)	LANL(c)	(WIPP)	UMTRA(f)	(ITRI)	Other Support Contractors(g)	Other DOE Offices(h)	Totals
1. Livestock & Livestock Products		5							5
2. Other Agricultural Products				1					1
3. Forestry & Fishery Products									
4. Agric., Forestry & Fishery Services		388	5						393
5. Mining, Crude Petroleum & Natural Gas		264	1,306	50					1,620
6. Construction	7,809	42,386	8,230	612		763			59,803
7. Ordnance & Chemical Man.			60					4	60
8. Food & Kindred Products Man.			49						49
9. Textiles Products & Apparel Man.		12	25						37
10. Lumber & Wood Products Man.		30	271						301
11. Paper & Publishing Man.		893	278	40	1				1,212
12. Petroleum Refining & Products Man.		286	1						288
13. Glass, Stone & Clay Products Man.		12	124		1				136
14. Primary & Fabricated Metals Man.		5,258	2,660	7				33	8,020
15. Computer, Office & Service Equipment Man.		9,692							9,692
16. Electrical Equipment Man.		3,830	5,644	13					9,616
17. Scientific Instruments Man.		944	1,275	14					2,313
18. All Other Man.		192	2,521				132	552	4,049
19. Motor Freight Transportation & Warehousing		217	81	28	3			2	330
20. All Other Transportation		3,247	491	24				85	3,849
21. Communication	2,251	10,051	2,285	228	9		23	166	15,013
22. Electric & Gas Utilities	892	15,293	16,716	1,175	16	381	33	193	34,751
23. Water & Other Utilities	10	768	38	5	2	223	9	25	1,080
24. Wholesale Trade		24,533	50,861	4,409	16				79,819
25. Retail Trade	1,424	38,900	56,180	8	385	1,669	4,302	2,171	105,424
26. Finance, Insurance & Real Estate		101	1,703	162	731	9	63	943	3,711
27. Hotel Restaurant & Other Personal Services		46	517		178			740	1,481
28. Data Processing & Computer Services		25,932	12,194	345	29	161		123	38,783
29. Management & Consulting Services		60,807	13,360	536	24	647	576	9,405	85,355
30. Engineering, Architecture & Surveying Services		33,905	28,018	793	7,214	22		10,400	80,376
31. Other Business Services	18,155	54,414	36,617	3,982	195	1,327	1,300	2,982	120,170
32. Automobile & Other Repair Services		827	3,293	75	11	47		145	4,447
33. Amusement, Recreation & Video Services		78	7		88				173
34. Health, Education & Social Services		29,570	7,071	1	14	54	48	4,367	41,126
35. Government Services	4	2,294	7,240	7	77			1,210	10,831
36. Local Government	4,261	15,184	2,866	1,569	700	30	69	288	25,325
37. State Government	6,392	23,717	4,792	2,353	1,273	44	104	599	40,259
38. United States Department of Energy (a)		0	0	0	0	0		0	0
39. Households	86,825	495,996	608,612	35,517	7,455	8,407	21,151	5,399	1,269,460
Total New Mexico Expenditures	128,122	900,038	875,816	51,951	18,421	13,784	14,922	39,843	2,056,389
Total Operating and Capital Budget	129,028	1,459,383	1,184,884	78,349	20,788	17,417	21,058	43,373	2,972,765

*Total may not add due to rounding

a. Any transfer money for services or products between specified activities is counted only in the activity of the last receiving agency.

b. Includes SNL.

c. Includes LANL, PT-LA, and Johnson Control.

d. Includes Westinghouse.

e. Includes only ITRI.

f. Includes Jacob's Engineering Group and M-K Ferguson Co.

g. Includes EG & G Rocky Flats, Ross Aviation and Other Contractors.

h. Includes Nevada, Oak Ridge and Other Operations Offices.

The two largest DOE contractors in New Mexico are LANL and SNL. To compare the two laboratories, the on-site maintenance and security contractors at LANL need to be included with the LANL figures. In FY 1994, LANL, with the two contractors, was funded at slightly less than $1.3 billion and SNL at slightly over $1.4 billion. In FY 1995, the LANL budget decreased to about $1.2 billion[2] while SNL increased to slightly over $1.45 billion. Total expenditures in New Mexico in FY 1995 were $875 million at LANL (including the two on-site contractors) and $900 million at SNL.

Other DOE contractors in New Mexico include ITRI, Ross Aviation, Jacobs Engineering Group, Inc., PT-LA (LANL), MK-Ferguson Company (UMTRA), Johnson Controls (LANL), Westinghouse Electric (WIPP), and Allied Signal. Each contractor assigned their in-state expenditures to one of 37 industrial sectors as summarized in Tables 3 and 4 and detailed in Appendix Tables 10-13.

[2]Johnson Control, Inc. and PTLA total operating and capital budget was accounted for twice in FY 1994, once in LANL's budget and once by the individual firms.

DOE contractors not in New Mexico reported only their expenditures in New Mexico. These included, M&H-SM Co., Inc. (the Pantex Plant in Texas), EG&G (the Mound Plant in Ohio only), and EG&G (the Rocky Flats Plant in Colorado plus support for SNL).

Tables 3 and 4 present total New Mexico expenditures by sector for DOE contractors and field offices. The last column in Table 4 also presents total DOE/New Mexico expenditures (the sum of the in-state expenses of DOE/AL, the in-state contractors, and the expenditures in New Mexico by out-of-state contractors and field offices). DOE expenditures in New Mexico for the FY 1982-1995 period are summarized in Figure 6. The in-state spending from the DOE/New Mexico total has increased steadily since 1982, to $2.2 billion expended in FY 1994 and then decreased to $2.1 billion in FY 1995.

Total DOE/New Mexico in-state expenditures (the initial respending of total operating and capital budgets) amounted to about $2.2 billion, or about 73 percent of the total budget in FY 1994 (Table 3). In FY 1995, in-state expenditures were about 69 percent ($2.1 billion) of the total DOE/New Mexico budget of $3.0 billion (Table 4). As a result, slightly over $916 million went to out-of-state purchases and salaries for those living elsewhere. SNL accounted for about 61 percent of the out-of-state spending, mainly because of a significant effort at Livermore, California. LANL accounted for another 34 percent, WIPP 3 percent, and others the remaining 2 percent.

The FY 1995 New Mexico funding, in-state expenditures, and employment by major entity, (excluding combined major on-site contractor effects), are presented in Table 5. Martin Marietta (SNL) had funding and in-state expenditures of $1.5 billion and $900.1 million, respectively. University of California (LANL not including maintenance and security construction) followed with $1.2 billion funding and $763.5 million in-state spending. DOE/AL was third with $129 million fund and in-state spending at $128.1 million.

DOE/New Mexico expenditures by major sectors in FY 1995 were personnel ($1.3 billion), services ($372 million), trade ($185 million), construction

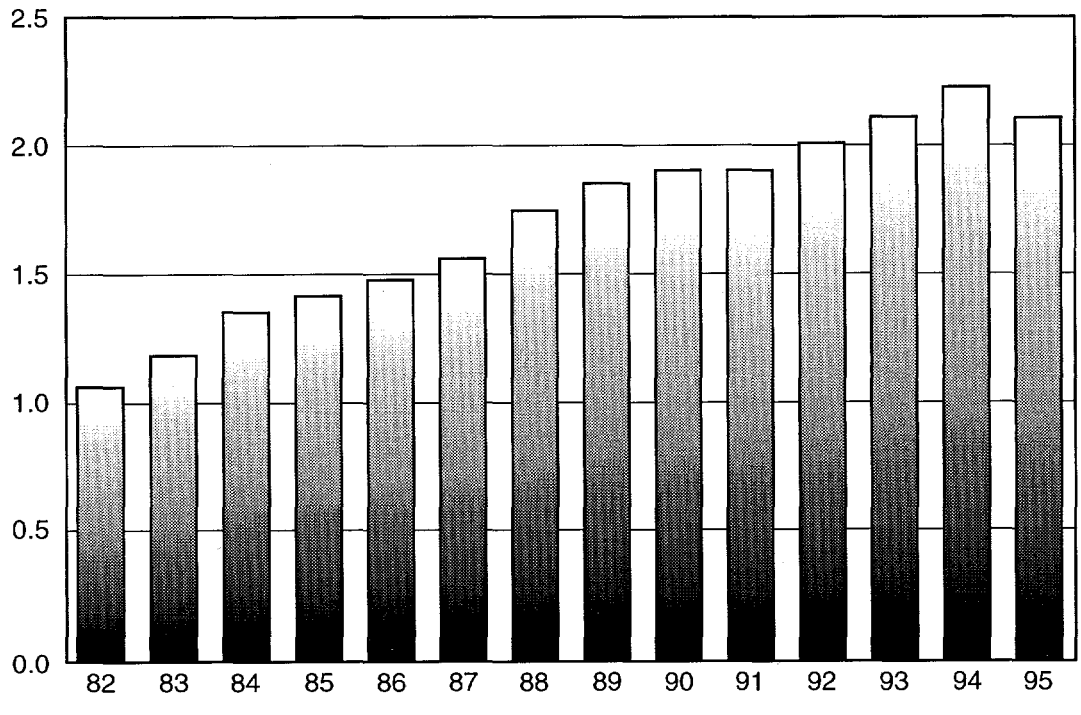


Figure 6. DOE Expenditures in New Mexico, FY 1982-1995.

Table 5. DOE/New Mexico Funding, Instate Expenditures and Employment by Major Entity in New Mexico, FY 1994 and FY 1995.

Entity	1994 New Mexico Funding	1994 Instate Expenditures	1994 New Mexico Employment	1995 New Mexico Funding	1995 Instate Expenditures	1995 New Mexico Employment
	---millions of dollars---		(jobs)	---millions of dollars---		(jobs)
Lockheed Martin (SNL)	1,419.1	1,063.1	8,069	1,459.4	900.1	8,153
Univ. of California (LANL)	1,144.6	747.6	8,926	1,185.9	763.5	8,558
US DOE Albuquerque Operations Office	140.5	140.5	1,130	129.0	128.1	1,133
Johnson Controls (LANL)	126.1	104.2	1,580	(a)	86.0	1,524
Westinghouse Electric Corporation (WIPP)	81.6	53.7	773	78.3	52.0	665
PT-LA	24.8	24.8	450	(a)	25.9	439
US DOE Nevada Operations Office	28.5	25.6	350	9.7	8.6	98
US DOE Idaho Operations Office	5.4	5.4		4.2	4.2	
Ross Aviation Inc	16.2	10.6	137	15.4	9.2	127
Jacob's Engineering Group. Inc (UMTRA)	19.3	12.0	65	14.6	12.2	62
Lovelace Medical Foundation (ITRI)	16.0	13.8	188	17.4	13.8	177
Allied Signal				18.5	16.8	267
Other Contractors New Mexico	7.0	7.0	17	5.7	5.7	9
M-K Ferguson Company Inc (UMTRA)	6.8	6.8	74	6.2	6.2	86
US DOE Oak Ridge Operations Office	3.6	3.6		6.8	4.3	8
Other US DOE Operations Offices	5.1	5.1	3	22.7	22.7	
TOTAL	3,044.6	2,223.7	21,762	2,972.8	2,059.4	21,307

Numbers may not add due to rounding.

Note: For certain organizations, employment includes part-time people as full-time equivalents; in other words, two persons who work twenty hours a week are counted as one employee.

a) Total Operating and Capital Budget for Johnson Control & Protection Technology -- Los Alamos is included in the LANL budget.

($60 million), manufacturing ($36 million), government ($77 million), and other sectors ($61 million) (Table 6). About 62 percent of total expenditures went for salaries, wages, and benefits. Salaries and wages (without benefit costs) accounted for about 51 percent of total expenditures. Salaries and wages (including fringe benefits) increased by about $14 million between FY 1994 and FY 1995.

In FY 1995, about 18 percent of the DOE/NM expenditures went for services, 9 percent for trade, 3 percent for construction, about 4 percent for government, 3 percent for other sectors, and less than 2 percent for manufacturing (Figure 7).

For FY 1994, about 57 percent of the expenditures went for salaries, wages, and benefits; about 18 percent for services; 10 percent for trade; over 6 percent for construction; slightly less than 4 percent for government expenditures (primarily state and local taxes); and less than 2 percent for manufacturing. Other sectors accounted for 3 percent (Table 6).

The number of jobs decreased from 21,762 in FY 1994 to 21,307 in FY 1995, for a net loss of 455 jobs (Table 5). The greatest decrease occurred at LANL with a loss of 368 jobs, followed by DOE Nevada

Table 6. DOE/New Mexico Expenditures in New Mexico by Major Sector, FY 1994 and FY 1995.

	FY-1994 thousands of dollars	(%)	FY-1995 thousands of dollars	(%)
I. Personnel				
A. Salaries & Wages	1,031,619	46.4%	1,045,184	50.8%
B. Benefits	223,814	10.1%	224,276	10.9%
Total	1,255,433	56.5%	1,269,460	61.6%
II. Construction	142,576	6.4%	59,803	2.9%
III. Manufacturing	34,362	1.5%	35,772	1.7%
IV. Trade	231,604	10.4%	185,243	9.0%
V. Services	399,130	17.9%	371,910	18.1%
VI. Government				
A. Local Government	29,180	1.3%	25,325	1.2%
B. State Government	51,247	2.3%	40,259	2.0%
C. Government Services	5,735	0.3%	10,831	0.5%
Total	86,163	3.9%	76,415	3.7%
VII. Other Sectors				
A. Agriculture	440	0.0%	399	0.0%,
B. Mining	4,327	0.2%	1,620	0.1%
C. T.C.U.(a)	61,014	2.7%	55,023	2.7%
D. F.I.R.E.(b)	3,326	0.1%	3,711	0.2%
Total	69,107	3.1%	60,753	3.0%
TOTAL EXPENDITURES	2,218,375	100.0%	2,059,389	100.0%

*Totals may not add due to rounding. See tables 10 and 11 of appendix for more detail

a. Transportation, Communications and Utilities

b. Finance, Insurance and Real Estate

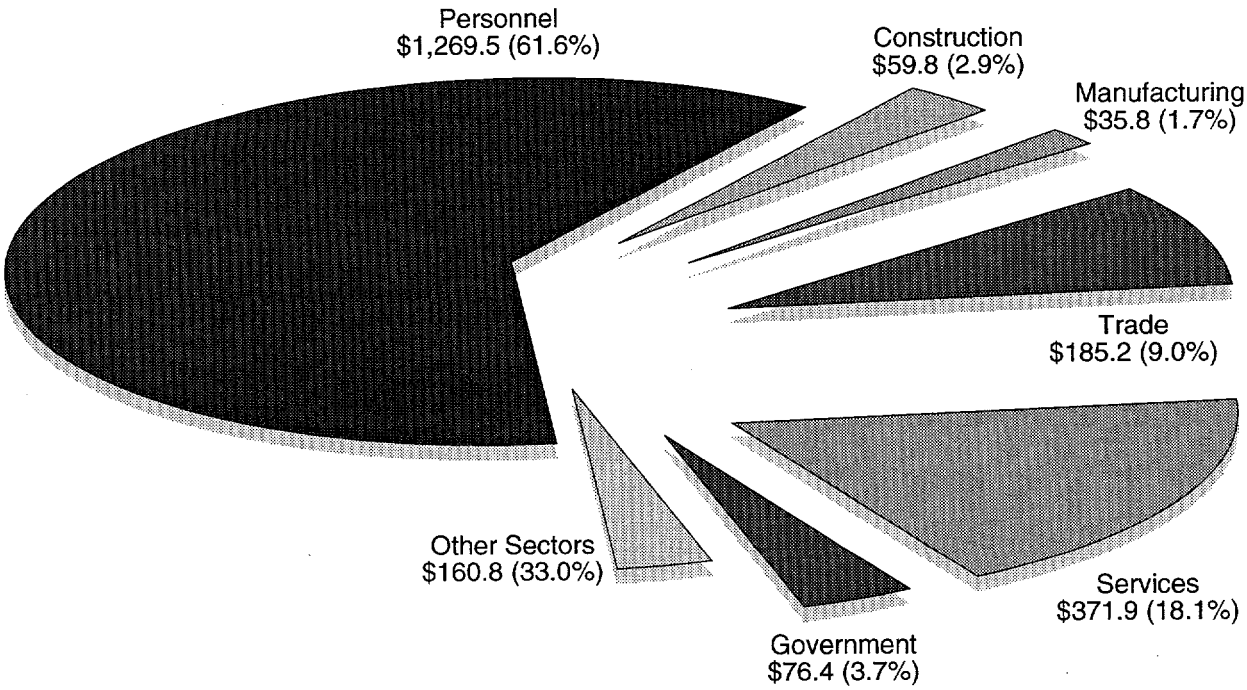


Figure 7. DOE Expenditures in New Mexico by Major Sector, FY 1995 (millions of dollars).

(operations in New Mexico) with a loss of 252 jobs and WIPP with a loss of 108 jobs. Some agencies had increased employment between FY 1994 and FY 1995. SNL had the largest increase with 84 additional employees. A new sub-contractor (Allied Signal) to DOE/AL came on line with 267 new employees.

The largest number of jobs as a result of DOE/AL funding for FY 1995 was at LANL which had 8,558 employees in FY 1995, followed by SNL with 8,153, Johnson Controls Inc. with 1,524, and DOE/AL with 1,133 (Table 5). These four entities comprised just over 90 percent of the total jobs funded by DOE/AL in FY 1995.

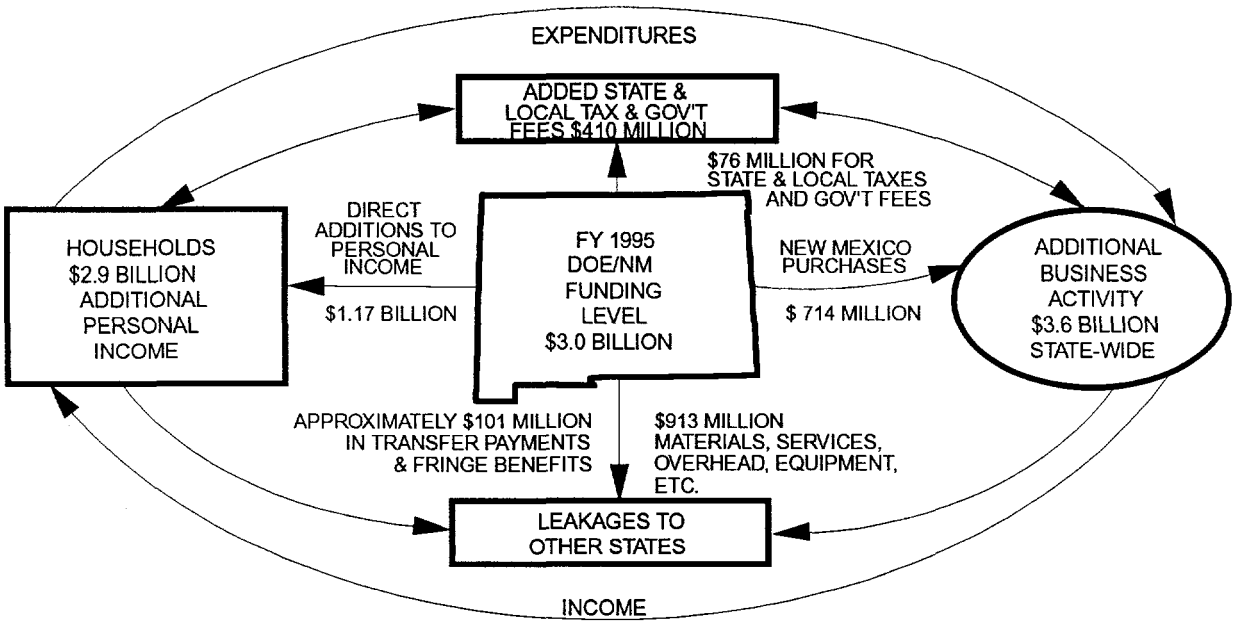
MEASURING DOE/NEW MEXICO'S ECONOMIC IMPACT

The analysis of DOE/New Mexico's economic impact on New Mexico employed an economic model that incorporates buying and selling linkages among regional industries. This analysis measures the impact generated by the AL, all the DOE/AL contractors, and other DOE offices expending money in the state. As previously stated, the term DOE/New Mexico is used to describe all of these entities.

One useful product of the I/O modeling technique is multipliers. Three multipliers—the first related to general economic activity, the second to income, and the third to employment—provide the information needed to estimate DOE's statewide impact. The activity multiplier identifies the extent to which an activity such as DOE relies directly and indirectly on the state economy to provide it with the materials, services, and labor required to conduct its activities, and the extent to which respending by businesses and industries occurs in the state. Income and employment multipliers make it possible to identify not only the direct impacts of an activity on income and jobs, but also the indirect (business) and induced effects (household).

ECONOMIC IMPACT OF DOE

The flow diagram (Figure 8) charts the movement of DOE expenditures. DOE expenditures for salaries and purchases go to households, statewide businesses, and other regions outside the state of



Total State-Wide Economic Impact -- $9.7 Billion

Figure 8. DOE Economic Impact on New Mexico, FY 1995.

New Mexico. This injection of money affects economic activity directly—that is, the effect precisely equals the amount allocated to DOE/New Mexico (slightly less than $3.0 billion).

Caution should be exercised when comparing economic impacts between FY 1993, FY 1994 and FY 1995 with prior years published in reports by Lansford et al. (1995 and 1994), Adcock et al. (1994 and 1992), Adcock and Lansford (1991), Adcock and Lansford (1990), and Adcock et al. (1989). The state and local tax coefficients and expenditure patterns were updated to FY 1992 levels, and the I/O model was also revised to better reflect the impact of local and state taxes. Also, caution should be exercised when comparing economic impacts between FY 1991, FY1992, FY 1994, and FY 1995 with fiscal years prior to FY 1991 because three different I/O models were used to estimate the impacts. New technical information released by the BEA, U.S. Department of Commerce in 1995 was incorporated in the FY 1994 and FY 1995 I/O models presented in Lansford et. al. (1995).

Households and businesses affected by DOE/New Mexico respend much of the money they receive in the state, creating an indirect (business) and induced (household) effect. In turn, businesses buy from other local firms and pay salaries to their employees, starting another round of spending. Every movement of money around the circle causes additional indirect and induced effects. However, some funds leak outside the region (state) when purchases are made elsewhere and are not available for further local spending. The indirect effects become smaller and smaller as continued respending and leakages to other areas outside the state occur.

Initial spending by DOE/New Mexico generated substantial first-round impacts on households (net) and businesses: $1.17 billion and $714 million, respectively for FY 1995 (Figure 8). Payments to state and local governments for taxes, services, and fees amounted to $76 million in additional revenues. A large portion ($913 million) of the initial spending flowed out of state. Respending by in-state businesses and purchases by households and state and local government eventually brought the total private business impacts to $3.6 billion. This does not include New Mexico private businesses that are M&O contractors, or their major on-site contractors that receive funding directly from DOE as identified elsewhere in this report. Also, respending activity will continue to add to personal income and government revenues; thus, total personal income increased to $2.9 billion and state and local government tax revenues and government services and fees expanded $410 million as a result of direct, indirect, and induced effects.

Overall Impact

No official figure exists for total economic activity in the state. For FY 1995, an estimate of the total is $84.6 billion (Table 7). The total impact of $9.7 billion in economic activity generated by DOE/AL accounted for about 11 percent of the estimated $84.6 billion total economic activity in the state. Thus, DOE/AL is an important economic factor in the state of New Mexico. DOE/New Mexico directly added $3.0 billion to the total economy in FY 1995 and FY 1994. The economic activity multiplier measures the volume of activity generated among various sectors of a region as a result of a $1 exogenous change in a sector. For example, the economic activity multiplier for DOE/New Mexico for FY 1995 was 3.25 (as compared with 3.45 in FY 1994). This indicates, for every $1 spent by DOE/AL and contractors another $2.25 was generated in the state, for a total impact of $3.25 in FY 1995.

Table 7 gives, in billions of dollars, the direct, indirect and induced, and total economic activity impact, of DOE/AL on the state of New Mexico. Results show the economic activity multiplier of 3.25 applied to the $3.0 billion DOE/New Mexico budget yields a total economic impact of about $9.7 billion, or more than $1 of every $9 of economic activity statewide. In 1994, the total economic impact of DOE/New Mexico was estimated to be $10.5 billion.

Table 7. DOE/New Mexico's Influence on New Mexico's Economy, FY 1995.

Economic Measure	Revised FY 1994 DOE	FY 1995 DOE	FY 1995 Total State	FY 1995 DOE as a % of State
		---billions of dollars--		%
Economic Activity				
Direct Expenditures	3.04	2.97		
Indirect and Induced (a)	7.45	6.70		
Total	10.49	9.67	84.6	11.4
Economic Activity Multiplier	3.45	3.25		
Personal Income				
Gross Labor Costs	1.23	1.27		
Net Wages and Salaries	1.16	1.17		
Indirect and Induced (a)	1.75	1.56		
Total	2.91	2.73	30.4 (b)	8.9
Personal Income Multiplier	2.51	2.34		
	------number of employees-----			
Employment				
Direct	21,762	21,307		
Indirect and Induced (a)	61,673	54,754		
Total	83,435	76,061	738,440 (c)	10.3
Employment Multiplier	3.83	3.57		

Numbers may not add due to rounding.
(a) FY 1994 results based on the FY 1995 econometric model.
(b) April 27, 1995 wire release, Bureau of Economic Analysis, U.S. Department of Commerce, Washington, D.C.
(C) New Mexico Department of Labor, Economic Research and Analysis Bureau, Table A, April 1995.

Appendix Table 17 gives the indirect economic impacts on private and public sectors for FY 1995. The retail trade sector received the greatest volume of indirect economic impacts, about 17 percent of the total indirect impacts. Other sectors with large indirect impacts were FIRE (14 percent), other business services (6 percent), health, education and social services, hotel restaurant and other personal services, wholesale trade, and electric and gas utilities (about 5 percent each).

Impact on Income

Personal income is the money that goes to individuals —money that will be respent for expenses such as groceries, cars and gasoline, mortgage payments, children's braces, new shoes, taxes, and savings. Most personal income consists of wages and salaries, although payments received as interest, rent, dividends, and Social Security benefits (payments to individuals) also count.

Income multipliers measure the indirect and induced effects of new income generated from payment to labor by DOE/New Mexico. The income multiplier was 2.34 for FY 1995 (Table 7) and 2.51 for FY 1994: for every $1 of personal income from DOE/New Mexico for labor, another $1.34 was generated in the state.

Application of the income multiplier of 2.34 to the direct net personal income figure of $1.17 billion (92 percent of wages, salaries and benefits) yields a total impact of $2.7 billion income created in the state by DOE/New Mexico activity. This compared to a total impact of $2.9 billion in FY 1994. In 1995, the BEA estimated the total personal income in the state of New Mexico was $30.4 billion (Table 7). DOE/New Mexico activities in the state accounted for about 9 percent, of the estimated $30.4 billion total personal income generated in the state.

Impact on Employment

Beside the dollars-and-cents impact, DOE/AL affects statewide employment. In addition to the average of 21,307 full-time jobs created by DOE/New Mexico in FY 1995, other jobs are supported by needs for goods and services, and by responses from individuals and businesses. Firms

filling those needs have their own employees, who in turn spend money with other firms who must consequently hire people. In addition, each individual employee needs goods and services, and helps support other jobs—for waitresses, mechanics, clerks, lawyers, nurses, and so on.

The employment multipliers measure the number of indirect and induced jobs supported, on the average, by DOE/New Mexico. Employment multipliers were estimated to be 3.57 for FY 1995 and 3.83 FY 1994: for every 100 jobs created by DOE/AL in New Mexico, another 257 jobs were supported in the state in FY 1995 and 283 jobs in FY 1994. This translates to a total impact of 76,061 jobs in FY 1995 and 83,435 jobs in FY 1994. The 76,061 jobs created or supported by DOE/New Mexico accounted for over 10 percent of total employment in the state for FY 95 (Table 7).

Table 17 in the Appendix shows the DOE/New Mexico indirect employment impact on private and public sectors for FY 1995. The more labor-intensive sectors received a greater indirect employment impact. Retail trade has the largest indirect impact, about 27 percent. Other sectors with large indirect employment impacts include lodging and personal services (10 percent), finance, insurance and real estate (FIRE) (10 percent), local and state government (9 percent), health and social services (8 percent), wholesale trade (5 percent),and other business service (5 percent). About one of every eight or nine jobs in the state was directly or indirectly supported by DOE/New Mexico for FY 1995.

TECHNOLOGY TRANSFER

SNL Albuquerque and LANL have had a significant effect on the state of New Mexico through technology transfer. Organized and built as a result of atomic research begun in New Mexico in 1943, these laboratories have undergone many changes, especially in the types of scientific research and engineering programs carried out at the facilities. The primary mission of both laboratories remains the same—ensuring the nation has a reliable nuclear deterrent. However, over the years other programs of a complementary nature or of particular national interest have been added—research on alternate energy sources, arms control and verification technologies, radiation-hardened components and semiconductors, advanced materials research, laser applications, and defense-related non-nuclear research, to name just a few.

Almost from their inception, the laboratories have engaged in some type of technology transfer. Both have used traditional methods of disseminating results of unclassified research, such as meetings with industrial groups, publishing technical papers, presentations to professional organizations, articles in trade and professional journals, and daily responses to inquiries by individuals and industries. But with the recent emergence of a new threat to our national security—the declining competitiveness of key U.S. industries in world markets--transferring technology from the national laboratories to the private sector has taken on important new dimensions. Growing public awareness of the dangers of this decline has prompted efforts to improve the nation's competitiveness by tapping the national laboratories to support U.S. industry. These efforts were strengthened by passage of the National Competitiveness Technology Transfer Act of 1989, which clearly identifies technology transfer as a mission of DOE's defense program laboratories. The Act grants the laboratories authority for pursuing cooperative relationships with industry, universities, and state and local governments more aggressively for the purpose of developing and transferring laboratory-developed technologies to the private sector. All DOE laboratories are developing new, more aggressive technology transfer programs to meet this new responsibility.

Technology transfer is a major effort directed nationwide, but the location of AL, LANL, and SNL in New Mexico provides a proximity advantage to the state. Both laboratories and AL are active with the state government's efforts to achieve "high-tech" economic development. The manager of AL, the director of LANL, and the president of SNL are members of the Governor's Technical Excellence Committee that advises the Governor on high-tech development policy issues. Loaned executives from SNL and LANL serve as special assistants to the secretary of New Mexico's Economic Development Department. Without doubt, the technology transfer programs of the national laboratories provide economic and social benefits to the state of New Mexico as well as to the nation.

Los Alamos National Laboratory

Los Alamos National Laboratory (LANL) is one of the largest multidisciplinary, multiprogram

laboratories in the world. It's vision is to creatively integrate science and technology with society's need to enhance global security, preserve our planet's environment, and to improve the quality of life of all people. The short form of their vision is-Science Serving Society.

The primary mission of LANL is "reducing the nuclear danger." An important secondary mission is to promote US industrial competitiveness by working with US companies in technology transfer and technology development projects. In support of these missions, LANL conducts extensive research in such varied fields as energy, nuclear safeguards and security, biomedical science, computational science, environmental protection and cleanup, and materials science.

The Industrial Partnership Office (IPO) serves as the single point-of-contact for industrial collaborations between US companies and Los Alamos' scientific and technical resources. The IPO's role is to promote the sharing that lies at the base of successful industrial collaborations which includes the sharing of employees, equipment, expertise, and technologies. LANL offers a variety of partnering relationships including cooperative research and development, licensing, staff exchanges, company-sponsored research and development, technical assistance, and use of over 50 Laboratory facilities. In addition, the IPO conducts aggressive small business and regional economic development programs that facilitate collaborations between the Laboratory and New Mexico's communities, educational institutions, state and local government agencies, and businesses.

The industrial partnerships in LANL's stewardship are true "dual-benefit" partnerships. Industrial partners gain an improved competitive position; perhaps they take a product to market more quickly or they reduce production costs significantly. The Laboratory gains because it improves capabilities required to meet the national security mission.

In FY 1995, Los Alamos provided the technical assistance and business counseling that helped five start-up companies launch their businesses. In addition, LANL entered into over 70 partnership agreements with New Mexican businesses large and small.

- 52 technical assistance agreements with small businesses and local organizations
- 8 cooperative research and development agreements (CRADAs); 5 with small businesses
- 1 user facility agreement (small business)
- 3 funds-in agreements
- 7 licensing agreements (small businesses)

Some examples of Los Alamos' partnerships with New Mexico businesses follow:

- Start-up Norsam Technologies, Inc., obtained a license for the HD-ROM (high-density, read-only-memory) archival storage medium for digital data.
- F2, a woman-owned small business in Albuquerque, received technical assistance in evaluating and modifying a laser-based coating removal system. As a result, F2 has captured more than $6 million in new contracts, which caused the company to hire several new employees.
- Four New Mexico firms-Sandia Strategic Services (Albuquerque), Eidlow (Santa Fe), Peacock Soup Artworks (Santa Fe), and BENROM (Taos)-were given assistance in developing business-related CD-ROM capabilities.
- Start-up company Laser Diagnostics (Los Alamos) used the Laboratory's user facilities to evaluate instrumentation that enabled the company to minimize incinerator emissions.
- Griego Electrochemical Technology Systems, Inc., a minority-owned small business in Grants, was able to obtain a start-up loan from a local bank based, in part, on an evaluation of its plating equipment by Laboratory scientists.
- Z-Tech Inc. (Santa Fe) received assistance in evaluating their "Recoil" running shoe design for its shock absorbency and energy return to the runner.
- Herbs Etc. (Santa Fe) obtained an evaluation of the active ingredients in golden seal root.
- Americulture (Cotton City) was able to improve their aqua culture process using the results of a surface water analysis performed by the Laboratory.
- High Mesa Technologies Inc. (Santa Fe) licensed the technology that enabled the start-up

company to launch its business of using plasma (hot ionized gas) technology to treat exhaust gases; the company also entered into a cooperative agreement with the Laboratory to further develop the technology.

- Through a cooperative research and development agreement, JP Accelerator Works (Los Alamos) obtained Los Alamos' assistance in investigating a high-power microwave source.

In addition, Los Alamos

- Conducted 4 workshops teaching small business owners how to write grant proposals for the Small Business Innovative Research (SBIR) and Small Business Technology Transfer (STTR) programs.
- Provided the hardware, software, and technical assistance that made it possible for 19 statewide Small Business Development Centers to connect to the Internet and World Wide Web.
- Provided the technical assistance and equipment loans that made it possible for the La Plaza de Taos Telecommunity to connect to the Internet and World Wide Web, making a vital communications and information resource available to small businesses in northern New Mexico.
- Assisted Northern New Mexico Community College (Espa=F1ola) in establishing a clean room that will be used to train microelectronics technicians.
- In a joint venture with the New Mexico Environment Department, created software that will be used to develop landfill opening and closing plans and to facilitate landfill siting and landfill permitting. The software may save hundreds of thousands of dollars for some 90 communities that will need to open or close landfills by 2000.
- Funded BizTech, a free, on-line business bulletin board that provides business information to New Mexico firms.
- Provided assistance that enabled Northern New Mexico Community College (Espa=F1ola) to expand the Internet connection service they provide to their satellite campuses, students, faculty, local schools, and business community.
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Sandia National Laboratories

Sandia National Laboratories has had a significant effect on the State of New Mexico through technology partnerships. Organized and built as a result of atomic research that began in New Mexico in 1943, Sandia has undergone many changes, especially in the types of scientific research and engineering programs carried out at the facilities.

Sandia's primary mission remains to ensure that the nation has a reliable nuclear deterrent, but over the years other programs of a complementary nature or of particular national interest have been added -- research of alternate energy sources, arms control and verification technologies, radiation-hardened components and semiconductors, advanced materials research, laser applications, and defense-related non-nuclear research, to name just a few. Sandia National Laboratories has a long history of successful partnerships with the private sector and academia, whether through relatively simple technical assistance arrangements with small businesses or collaborative technology development with one or more large companies or a consortium.

Sandia's history of transferring technologies developed in weapons and energy programs to the civilian industrial sector predates the legislative mandate for technology transfer by more than three decades. Long before technology transfer became a mission assigned to Sandia by the National Competitiveness Technology Transfer Act of 1989, Sandia learned that teamwork with industry, both in technology development and transfer, is a smart business practice that enhances its ability to meet its obligations.

In all of its partnering activities, Sandia is committed to protecting national security interests, providing fairness of opportunity, creating lasting value to the taxpayer, and adhering to the highest ethical standards to avoid even the appearance of conflicts of interest.

Opportunities for working with Sandia are many and varied.

Cooperative Research and Development Agreements (CRADAs)

Through cooperative research and development agreements, Sandia participates with industry and universities in mutually beneficial collaborative projects. Typically, Sandia and one or more partners

from industry or academia share costs and pool the results from a particular research and development project; satisfying critical needs in the private sector while strengthening and enhancing Sandia's ability to continue to perform its DOE mission responsibilities.

Sandia CRADA partners include municipal governments, universities, industrial consortia, other laboratories, and large and small businesses. CRADA projects are distributed among six broad technical areas: advanced manufacturing and precision engineering, computer architecture and applications, energy and environment, materials and processes for manufacturing, microelectronics and photonics, healthcare technologies. Since our first CRADA was signed in June 1991, we have initiated 272 CRADAs with a total value of more than $800 million.

Technical Assistance

Sandia may provide technical assistance if that assistance does not compete with services available from private industry. Sandia has two processes for funding technical assistance projects. The first is total funding by the industry partner, called funds-in technical assistance. The second process is limited to small businesses and is performed at no cost to the business, using funds provided by DOE to support the work done by Sandia. This assistance is provided through Sandia's Small-Business Initiative program.

Small-Business Initiative

In conjunction with Lawrence Livermore, Los Alamos National Laboratories and Y-12 at Oak Ridge, Sandia has established a Small-Business Initiative (SBI). The mission of the SBI program is to make the Laboratories' resources available to small businesses. Sandia works with small-business development centers, cooperative extension services, chambers of commerce, state economic development agencies, and vocational education institutions to identify technology partners. Included in the program are regional, short-term technical assistance programs in New Mexico, California, Arizona, Texas, and the Midwest. Also included are partnerships with industry associations to reach a greater number of small business clients by addressing common problems and opportunities and matching Sandia capabilities with the needs of small businesses.

Sandia's SBI program uses the unique capabilities, expertise, and facilities at Sandia to provide technical assistance to small businesses. The mission is to improve the competitiveness of U.S. small businesses. Our customers include a broad collection of small manufacturing firms, R&D companies, and scientific organizations with various technology needs.

To determine the value and benefits of the program to our stakeholders--U.S. taxpayers, the Department of Energy, U.S. small businesses and the participating federal laboratories--the SBI office surveys its customers to capture both short-term and long-term economic impact. Immediately after a technical assistance case closes, and as a part of a pilot study again about one year after closure, we conduct surveys that focus on the following areas of interest: jobs created, jobs retained, revenue increases, process and quality improvements, reduced costs, access to new markets, new sales contracts, and the development of new products. We have also interviewed participating laboratory personnel to assess the benefits that flow back to the laboratory from the SBI program. Some results of this survey follow:

- In 1995 the median total economic benefit cited was $30,000 per technical assistance case. Total economic impact is defined as the sum total (current and projected) of new revenues, avoidance of sales lost, and cost avoidance resulting from technical assistance.
- In 1995 a broad distribution of values were reported by SBI customers for total economic impact--ranging from 0$ to $19 million.
- In 1995 customer survey results revealed a median of 2 jobs created per technical assistance.
- The pilot study of long-term impact revealed that a significant amount of business activity related to the technical assistance occurred at least one year later. Of the six New Mexico companies interviewed in the pilot study of long-term impact, we found 8 new contracts generated with a combined value of $55 million in annual revenues and 105 new jobs created--at least one year after technical assistance was received. In addition, we discovered 5 new contracts currently in negotiation with anticipated future value of $70 million.

Licenses

Sandia also issues licenses. Within broad guidelines governing, for example, conflict-of-interest and fairness-of- opportunity activities, Sandia is free to negotiate a variety of terms and conditions for its technology licenses. These terms and conditions are intended to protect the federal government's investment in the technology, to encourage the licensee to make additional investments, and to ensure commercialization of the technology and the attendant benefits to the U.S. economy.

To encourage a higher level of licensing, an action team including researchers, the patents and legal organization, and the Technology Transfer Center is working to establish a process for making our intellectual property assets more readily available to industry. The process will include reviews of invention disclosures to identify good candidates for patenting and licensing. These candidates will then be broadly advertised, and workshops will be held to select the best qualified contenders to compete for specific licenses, and ultimately, enter into licensing negotiations.

To promote the effective use of technologies in as many ways as possible, Sandia tries to license a given technology non-exclusively or exclusively to different users for specific fields of use. Sandia's aim is to remain flexible and take into account the unique circumstances of each technology and licensee.

User Facilities

Many of Sandia's unique facilities such as its Combustion Research Facility; Component Modeling and Characterization Laboratory; Design, Evaluation, and Test Technology Facility; and others can be accessed by private-sector companies, universities, and other laboratories through a simple agreement. Research and technology development activities conducted in these facilities satisfy a broad spectrum of dual-use needs for government and industry.

Intermediaries

Sandia is pleased to work with intermediary organizations that facilitate the transfer of Sandia technologies to small businesses through independent, complementary, actions. Intermediaries may include organizations such as small-business development centers, government agencies, universities, and community colleges, and the Technology Ventures Corporation.

A nonprofit organization, Technology Ventures, established in 1993 by Martin Marietta, now Lockheed Martin, is an important contributor in the formation of new businesses built on leading-edge technologies developed at Department of Energy laboratories, and in the expansion of existing businesses. It also assists in obtaining funding offers for many of its client companies. Among Technology Ventures clients are a number of companies that were founded on technologies developed at Sandia: Quantum Manufacturing, Inc.; Boissiere Engineering & Applied Robotics, Inc.; ATTIIN, Inc.; JEC Technologies, Inc.; Micro-Optical Devices, Inc.; MuSE Technologies, Inc.; and Silicon MicroDevices, Inc.

GLOSSARY OF TERMS

ACL	Advanced Computing Laboratory
AEC	Atomic Energy Commission
AL	Albuquerque Operations Office
BEA	Bureau of Economic Analysis, U.S. Department of Commerce
CAO	Carlsbad Area Office
CRADA	Cooperative Research and Development Agreement
CTA	Central Training Academy
DOE	Department of Energy
ELQ	Employment Location Quotient
EPA	Environmental Protection Agency
EQRC	Electronics Quality/Reliability Center
ES	Employment Security
FAA	Federal Aviation Administration
FIRE	Finance, Insurance, and Real Estate
FW	Factor Weights
FY	Fiscal Year
GOCO	Government-Owned and Contractor Operated
I/O	Input-Output
IPO	Industrial Partnership Office
ITRI	Inhalation Toxicology Research Institute
KAFB	Kirtland Air Force Base
LANL	Los Alamos National Laboratory
M&H-SM Co., Inc.	Mason and Hanger-Silas Mason Co., Inc.
MSHA	Mine Safety Health Administration
M&O	Management and Operating
NCMS	National Center for Manufacturing Sciences
NIST	National Institute of Standards and Technology
NMSU	New Mexico State University
R&D	Research and Development
SCIAD	Sandia's Science Advisor
SIC	Standard Industrial Classification
SNL	Sandia National Laboratories
STC	Superconducting Technology Center
TRANSAX	Transportation Accident Exercise
TRU	Transuranic
TSTC	Transportation Safeguards Training Center
TTR	Tonopah Test Range
UMTRA	Uranium Mill Tailings Remedial Actions
UNM	University of New Mexico
WERC	Waste-Management Education and Research Center
WIPP	Waste Isolation Pilot Plant
WSI	Wackenhut Services Inc.
WTAC	Waste Isolation Pilot Project Technical Assistance Contractor
XLQ	Output Location Quotient

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APPENDIX

REGIONAL INPUT-OUTPUT MODELING TECHNIQUE

Input-Output Model Flow Diagram

Figure 9 is a visual representation of the steps involved in the regional input-output modeling process. Industry input-output tables for the U.S. for 1987, the most recent year available, were obtained from the interindustry Economics Division of the BEA within the U.S. Department of Commerce. This national data provided the initial input in the form of the latest national direct requirements matrix of 475 private and public input-output sectors.

A regional model sector plan of 37 local regional sectors, not including DOE and households sectors, was developed from the 475 national sectors. Sector delineation was based on the following aspects of the state's economy:

(1) major industries or commodity groups,

(2) unique industries that appear to influence the level of economic activity significantly, and

(3) sector interactions thought to be important for later policy evaluation.

As a result of obtaining the BEA 1987 base year I/O model, the DOE/NMSU I/O model was updated from a 1982 base year to a 1987 base year for the FY 1994 and FY 1995analysis. The I/O model used the same number of economic sectors (37) as the 1982 based I/O model for 1993 (Table 8). The economic sectors were restructured to better reflect economic activity in the state of New Mexico; therefore, the results of the 1987 based I/O model are not comparable with the results from the 1982 based I/O models. Compared to the previous DOE/NMSU I/O model agriculture, mining, and construction sectors were not changed (Table 8). The 11 manufacturing sectors were redefined to 12 sectors by breaking computers, office and service equipment out of rubber, plastics, and miscellaneous manufacturing (sector 17). The new manufacturing sectors are ordnance and chemical; food and kindred products; textiles and apparel; lumber and wood products; paper and publishing; petroleum, refining and products; glass, stone, and clay products; primary fabrication and metal; computer, office, and service equipment; electrical equipment; scientific instruments; and all other (sectors 7-17). Transportation, Communications and Utilities (TCU) was left unchanged with four

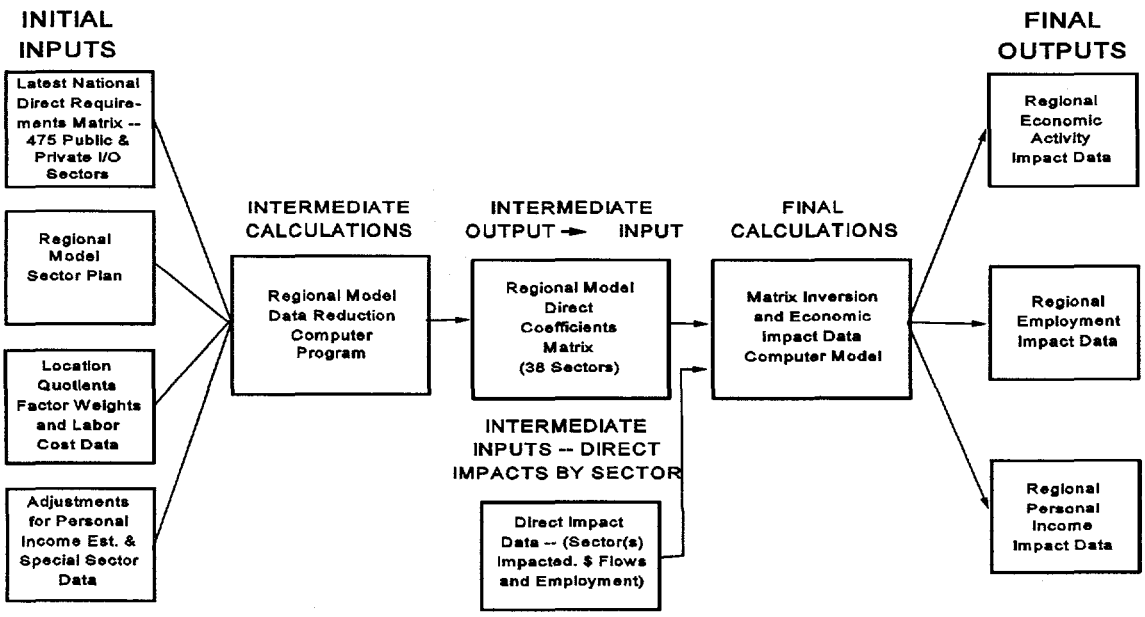

Figure 9. Input-Output Model Flow Diagram.

Table 8. Economic Sectors Used in FY 1994 and 1995 Input-Output Model Compared to Economic Sectors Used in FY 1993 Input-Output Model.

Economic Sector	**FY 1993** *I/O Model Sector*	**FY 1994 and 1995** *I/O Model Sector*
Agriculture	1. Livestock & Livestock Products 2. Other Agricultural Products 3. Forestry & Fishery Products 4. Agric., Forestry & Fishery Services	1. Livestock & Livestock Products 2. Other Agricultural Products 3. Forestry & Fishery Products 4. Agric., Forestry & Fishery Services
Mining	5. Mining, Crude Petroleum & Natural Gas	5. Mining, Crude Petroleum & Natural Gas
Construction	6. Construction	6. Construction
Manufacturing	7. Ordnance & Chemical Manufacturing 8. Food & Kindred Products 9. Textiles Products & Apparel 10. Lumber & Wood Products 11. Paper & Publishing 12. Petroleum Refining & Products 13. Glass, Stone & Clay Products 14. Primary & Fabricated Metals 15. Electrical Equipment 16. Scientific Instruments 17. Rubber, Plastics & Miscellaneous	7. Ordnance & Chemical Manufacturing 8. Food & Kindred Products 9. Textiles Products & Apparel 10. Lumber & Wood Products 11. Paper & Publishing 12. Petroleum Refining & Products 13. Glass, Stone & Clay Products 14. Primary & Fabricated Metals 15. Computer, Office & Service Equipment 16. Electrical Equipment 17. Scientific Instruments 18. All Other
Transportation, Communications, and Utilities	18. Rail Transportation 19. Transportation & Warehousing 20. Other Transportation 21. Communication 22. Electric & Gas Utilities 23. Water & Other Utilities	19. Motor Freight Trans. & Warehousing 20. All Other 21. Communication 22. Electric & Gas Utilities 23. Water & Other Utilities
Trade	24. Wholesale Trade 25. Retail Trade	24. Wholesale Trade 25. Retail Trade
Finance, Insurance and Real Estate	26. Finance, Insurance & Real Estate	26. Finance, Insurance & Real Estate
Services	27. Lodging & Personal Services 28. Computer & Data Processing Services 29. Consulting Services 30. Engineering Services 31. Miscellaneous Business Services 32. Automobile & Other Repair Services 33. Amusements 34. Health & Social Services	27. Hotel Restaurant & Other Personal 28. Data Processing & Computer 29. Management & Consulting 30. Engineering, Architecture & Surveying 31. Other Business 32. Automobile & Other Repair Services 33. Amusement, Recreation & Video 34. Health, Education & Social
Government	35. Government Services 36. Local Government 37. State Government	35. Government Services 36. Local Government 37. State Government
	38. United States Department of Energy	38. United States Department of Energy
	39. Households	39. Households

sectors. Trade was left unchanged with 2 sectors: wholesale and retail. FIRE sectors were combined into one sector (sector 26). The service sectors were also left unchanged with nine separate sectors (sectors 27-34): lodging and personal services; data and computer processing; management consulting; engineering; other business; automobile and other repair; amusements, recreation and videos; health, education, and social; and government services (sector 35).

Collapsing the 475 national sectors into 37 regional sectors required the calculation of location quotients and factor weights for the 475 national sectors from employment and output data. Application of location quotients on a row-by-row basis and factor weights on a column-by-column basis to the national direct coefficients matrix and summing within sectors, results in the aggregation of the 475-by-475 national to a 37-by-37 regional/state matrix. Location quotients adjust the level of purchasing of inputs from the national level to a regional level.

Calculating special sector data, including both the DOE/New Mexico (sector 38) and households (sector 39) resulted in 39 sectors, as shown in subsequent tables throughout the report. The DOE/New Mexico expenditure pattern, or in-state production function, was developed by contacting appropriate individuals in organizations designated as contractors or field offices (DOE/New Mexico) for total operating and capital budget information and the pertinent breakdown of expenditures into the 39 sectors. Direct coefficients for column 38 (DOE/New Mexico) were simply dollar amounts in various sectors divided by the total operating and capital budget. In Row 38 output coefficients do not exist because DOE/New Mexico does not produce output for in-state consumption directly. In order to calculate Type II multipliers, the household sector must be included in the processing sector. Column coefficients for personal consumption expenditures and row coefficients for labor costs were calculated from the national use table.

The intermediate and final modeling processes involves the model calculating a regional direct coefficients matrix, a regional direct, indirect, and induced coefficients matrix (through matrix inversion), Type II economic activity multipliers, and appropriate output that allow easy hand calculation of Type II income and employment multipliers.

Location Quotients, Factor Weights, Average Wages

Location quotients adjust the level of input purchasing in the national coefficients table to create a regional coefficients table. The two types of location quotients used in this analysis were the employment location quotient and output location quotient. Both types of location quotients assess the importance of an industry in a region with its relative importance in the nation. The employment location quotient uses employment figures, while the output location quotient uses dollar volume of output.

A location quotient equal to 1 indicates the region is producing its domestic needs specific to that industry. A location quotient less than 1 implies the region is not producing its domestic needs in relation to the industry, and therefore, part of the industry-specific consumption of that region is imported. A location quotient greater than 1 implies the region is producing goods for export. At least two assumptions are necessary for this technique to be viable: (1) consumption patterns are fairly similar for the nation and the region; and (2) imports are small relative to total production. Reference 1 gives an excellent overview of location quotients.

Location quotients were calculated for the state of New Mexico using 1995 employment data for all sectors except agriculture. Output location quotients were calculated for the agriculture sectors using 1994 cash receipts and value of production data. Again, the national technical coefficients are from 1987. In using 1994-1995 data to derive a coefficients matrix for the state, it is assumed the production process did not change significantly between 1987 and the 1995 time period, and the techniques of production in the state of New Mexico for 1995 are similar to those in the U.S. for 1987.

The Employment Location Quotient (ELQ) is defined as:

$ELQ=(e_i/e)/(E_i/E)$

where

ELQ is defined as the employment location quotient,

e_i is the regional employment in the ith industry

e is the total employment in the region,

E_i is the national employment in the ith industry, and

E is the total national employment.

The Output Location Quotient (XLQ) is defined as:

$XLQ=(x_i/x)/(X_i/X)$

where

XLQ is defined as the dollar output location quotient,

x_i is the dollar output of the ith industry in the region,

x is the dollar output of all industry in the region,

X_i is the dollar output nationally of the ith industry, and

X is the total dollar output of all industry in the nation.

The output location quotient was used in this study for the agriculture sectors only, because data on employment in those sectors was incomplete.

Calculation of Employment Location Quotients, Industry Specific Average Wages, and Coefficient Combining Factor Weights

Employment location quotients, factor weights, and average wages (for all sectors except agriculture) were obtained from the New Mexico Department of Labor in Albuquerque for this study. The ES-202 report gives 1st quarter data on the number of employees, number of firms, and total wages paid, sorted by the four-digit Standard Industrial Classification (SIC) code number for the state.

Calculation of location quotients proceeded as follows. Each of the 475 sectors of the national data was numbered consecutively for identification. Using the ES-202 state employment data and the SIC codes corresponding to each of the 475 national sectors, the number of specific industry employees (e_i), as well as total wages (for calculation of average wages), were noted for each appropriate sector. National employment for each SIC code was also noted (E_i). Derivation of location quotients was (e_i/E_i)/constant (the constant is the total employment in the state divided by total employment in the nation).

Employment data were also used to derive factor weights, which were calculated from the proportional employment (output for agriculture) of each of the 475 sectors relative to the state model sector plan. Factor weights are defined as follows:

where

Fw_{ij} is the factor weight for the national sector contained in the jth regional (state) sector,

i is a national sector (1, ..., 475),

j is a regional sector (1, ..., 35) Sectors 36 through 39 are calculated separately and added to the regional model in a later step after the national matrix has been reduced.

k is the set of all national sectors contributing to regional sector j.

e_i is the regional employment in national sector I,

e_k is the regional employment in national sector I that is a member of set k.

In other words, the factor weight, Fw_{ij}, is the fraction of regional employment (output for agriculture) in national sector I relative to total regional employment in all national sectors contributing to regional sector j. Factor weights are used in two ways: (1) to calculate each aggregated sector's average wage. (Each sector's average wage was multiplied by its factor weight and summed for the aggregate,) and (2) to aggregate the 475 x 475 national matrix to a 39 x 39 regional matrix within the model.

One shortcoming of using employment location quotients is that the only data available was covered employment. The ES-202 report "summarizes employment and wage data for workers covered by state unemployment insurance laws and for civilian workers covered by the program of Unemployment Compensation for Federal Employees." Therefore, certain services

(such as real estate and domestic servants) may not be completely covered, and small "mom and pop" businesses (especially in the agriculture sector) were excluded.

Also, all construction sectors at the national level were identified by the two-digit SIC codes 15-17. Construction sectors were therefore not differentiable. Thus, all were aggregated into one construction sector at the state level and the appropriate location quotient was calculated for the aggregated sector.

Calculation of Output Location Quotients

Output location quotients were calculated for both sectors 1 and 2. Regional sector 1 (livestock and livestock products) includes these national sectors; dairy farm products, poultry and eggs, meat animals, and miscellaneous livestock. Regional sector 2 (other agricultural products) includes these national sectors; cotton, food grains, feed grains, grass seeds, tobacco, fruits, tree nuts, vegetables, sugar crops, miscellaneous crops, oil-bearing crops, forest products, and greenhouse and nursery products. To calculate the output location quotients for the two regional agricultural sectors, the following formula was used:

$XLQ=(x_i/X_i)/(x/X)$ [see previous notation]

Cash receipts and value of production data were used for the dollar output portion of the output location quotient equation. Cash receipts data were available for all agricultural sectors at the regional level. Value of production data were used for agricultural sectors at the national level if cash receipts data were not available. Value of production, as applied to crops, is derived by multiplying production by the estimated season average price received by farmers for that portion of the commodity actually sold. Thus, cash receipts data for each agricultural sector were added for the region to give x_i and cash receipts and value of production data for the U.S. were used for X_i. Each sector's composition was checked for consistency between regional and national levels.

The denominator of the output location quotient equation, (x/X), is the dollar output of all industry in the region divided by the total dollar output of all industry in the nation. Output of all industry for the region is not available: thus, personal income was used as a proxy to provide a relative size for both x and X.

Factor weights for each agricultural sector were calculated in a manner similar to that described above for other sectors that used employment data. Dollar output for each agricultural sector was divided by the total dollar output for the corresponding aggregated sector.

Factor weights for the agricultural sectors were used only in the aggregation of sectors in the national matrix to the two agricultural sectors in the state matrix. Average weekly earnings for agriculture for crops, livestock, and forestry were obtained from "Covered Employment and Wages," Quarterly Report, First Quarter, 1995, New Mexico Employment Security Department, Economic Research and Analysis Bureau, Albuquerque, New Mexico. Annual wages were derived by multiplying the weighted average weekly earnings by 52.

DOE/NEW MEXICO EXPENDITURES PATTERNS

The expenditure pattern (production function) of DOE/New Mexico was derived as follows:

Regional expenditures as well as operating and capital budgets for FY 1994 and FY 1995 were collected from DOE/AL contractors in the state. For DOE/AL contractors not in the state, only amounts expended in the state were collected. Total expenditures in the state during FY 1994 and FY 1995 were also collected for the DOE/AL and other DOE offices that spend money in New Mexico. The expenditure information was obtained by each of the 39 model sectors, to the extent possible (because smaller contractors and field offices could not provide a detailed breakdown).

MODEL RESULTS

Tables 9 and 10 for FY 1994 and Tables 11 and 12 for FY 1995 are the data received from the various elements of DOE/New Mexico. These data were summarized in Tables 4 and 5 in the previous section.

The input-output modeling process results in the following output: (1) a direct coefficient matrix, and (2) a direct, indirect, and induced coefficient matrix. From these matrices, various multipliers

Table 9.--DOE New Mexico Expenditures (in Dollars) by Sector and Total Operating Budget, Contractors, FY 1994

Sector	Lovelace Bio.& Env. Research Institute (ITRI)	Jacob's Engineering Group. Inc (UMTRA)	University of California (LANL)	PT-LA (LANL)	M-K Ferguson Company Inc. (UMTRA)	Johnson Controls (LANL)	Rose Aviation Inc.	Martin Marietta (SNL)	Westinghouse Electric Corp. (WIPP)	Other Contractors in New Mexico (a)	Total Expenditures by Contractors in New Mexico
1. Livestock & Livestock Products											0
2. Other Agricultural Products			10,000						36,521		46,521
3. Forestry & Fishery Products											0
4. Agriculture, Forestry & Fishery Services			26,807					366,522			393,329
5. Mining, Crude Petroleum & Natural Gas			1,296,117					3,030,436	485		4,327,038
6. Construction	361,793		8,556,196				54,720	126,196,906	1,067,596		136,259,215
7. Ordnance & Chemical Manufacturing			47,073					111,489		14,465	173,027
8. Food & Kindred Products Manufacturing			32,646	7,880				0			40,526
9. Textiles Products & Apparel Manufacturing			42,527	41,725				121,467			205,719
10. Lumber & Wood Products Manufacturing			341,393	4,000	671			119,309			465,373
11. Paper & Publishing Manufacturing			264,822					1,869,603			2,134,425
12. Petroleum Refining & Products Manufacturing							592,065	235,330	26,215		853,630
13. Glass, Stone & Clay Products Manufacturing			734,442					23,087			757,529
14. Primary & Fabricated Metals Manufacturing			3,064,109					3,868,829			6,972,938
15. Computer, Office & Service Equipment Manufacturing			5,923					5,856,350			5,862,262
16. Electrical Equipment Manufacturing			6,561,879					5,396,199	56,265		12,014,363
17. Scientific Instruments Manufacturing			557,555					3,167,256		35,405	3,760,216
18. All Other Manufacturing			5,923					269,960		11,577	287,460
19. Motor Freight Transportation & Warehousing			72,744		4,113			1,350	26,562		106,769
20. All Other Transportation			3,795,794				39,863	124,099	51,018		4,010,774
21. Communication	456,225	26,321	1,634,972				56,059	6,897,342	6,000		9,106,919
22. Electric & Gas Utilities	797,866		1,327,677		44,456	27,662,876	119,610	16,350,451	829,967		47,133,127
23. Water & Other Utilities			76,056		1,944	473,932	9,765	723,596	14,795		1,302,092
24. Wholesale Trade			67,939,315					37,552,043	2,965,042		108,476,400
25. Retail Trade	1,705,133	304,449	56,755,441		385,143		271,806	55,971,106	11,536	3,561,952	118,966,370
26. Finance, Insurance & Real Estate	9,132	301,963	996,265		297,013		50,070	433,829	4,367		2,182,659
27. Hotel Restaurant & Other Personal Services		25,969	975,804	80,000	16,575	104,835		57,678		102,870	1,363,634
28. Data Processing & Computer Services	161,748	42,756	13,302,199					43,962,770	1,480,073		58,969,546
29. Management & Consulting Services	109,302	67,606	14,994,966	13,600	9,566			54,620,593	10,560	1,115,323	70,961,740
30. Engineering, Architecture & Surveying Services	8,635	6,956,631	32,606,163		60,461			59,095,386	231,915	11,810	98,971,023
31. Other Business Services	1,305,939	99,495	26,122,004	73,250	102,599	1,119,372	1,072,866	73,567,796	3,909,146	901,415	106,303,884
32. Automobile & Other Repair Services	42,760	2,320	1,467,796		16,858			379,521	2,547	43,826	1,955,628
33. Amusement, Recreation & Video Services		46,042	207,510		5,726			123,759			383,037
34. Health, Education & Social Services	74,592	7,530	9,004,704	37,660	6,759		10,607	19,055,884	49,624	250	28,247,610
35. Government Services		26,267	3,104,574		17,676		522,776	1,753,063			5,424,306
36. Local Government	19,190	301,726	395,915	557,947	664,517	218,156	80,342	21,954,024	1,306,114	45,359	25,523,293
37. State Government	38,439	705,596	793,020	636,920	782,612	327,237	116,613	35,877,652	2,616,149	95,465	42,191,904
38. United States Department of Energy											0
39. Households	8,670,613	2,967,565	490,442,948	23,117,525	4,376,869	74,323,131	7,663,729	483,663,466	36,941,745	1,056,130	1,135,443,744
Total New Mexico Expenditures	13,793,369	12,012,162	747,585,328	24,770,707	6,793,600	104,229,543	10,643,115	1,063,090,206	53,686,264	6,995,847	2,043,600,162
Total Operating and Capital Budget	16,037,937	19,300,000	1,144,635,307	24,839,900	6,793,600	126,104,092	16,229,014	1,419,057,813	81,555,000	6,995,847	2,861,548,510

a. Includes Chem Nuclear GeoTech, Inc., Martin Marietta Specialty Components, Inc.,Mason & Hanger-Silas Mason Co., Inc., Pantex, and EG & G Mound Applied Technologies, Rust Geotech, Inc.

b. Any transfer of money for services or products between specified activites is counted only in the activity of the last receiving agency.

Table 10. DOE NM Expenditures (in dollars) by Sector and Total Operating Budget, US DOE Offices and Total Expenditures, FY 1994

	US DOE Albuquerque Field	US DOE Idaho Operations	US DOE Nevada Field	US DOE Oak Ridge Field	Other US DOE Field	Total Expenditures by DOE Offices	Total Expenditures by Contractors	Total Expenditures by US DOE in
1. Livestock & Livestock Products						0	0	0
2. Other Agricultural Products						0	46,521	46,521
3. Forestry & Fishery Products						0	0	0
4. Agric., Forestry & Fishery Services						0	393,329	393,329
5. Mining, Crude Petroleum & Natural Gas						0	4,327,038	4,327,038
6. Construction	6,316,343					6,316,343	136,259,215	142,575,558
7. Ordnance & Chemical Manufacturing						0	173,027	173,027
8. Food & Kindred Products Manufacturing						0	40,528	40,528
9. Textiles Products & Apparel Manufacturing						0	205,719	205,719
10. Lumber & Wood Products Manufacturing						0	465,373	465,373
11. Paper & Publishing Manufacturing						0	2,134,425	2,134,425
12. Petroleum Refining & Products Manufacturing						0	853,630	853,630
13. Glass, Stone & Clay Products Manufacturing						0	757,529	757,529
14. Primary & Fabricated Metals Manufacturing						0	6,972,938	6,972,938
15. Computer, Office & Service Equipment Manufacturing						0	5,862,282	5,862,282
16. Electrical Equipment Manufacturing						0	12,014,363	12,014,363
17. Scientific Instruments Manufacturing					462,192	462,192	3,780,216	4,242,408
18. All Other Manufacturing			352,535			352,535	287,480	640,015
19. Motor Freight Transportation & Warehousing			73,422			73,422	106,769	180,191
20. All Other Transportation			1,110,079		71,446	1,181,525	4,010,774	5,192,299
21. Communication	2,143,983		144,946			2,288,929	9,108,919	11,397,848
22. Electric & Gas Utilities	776,653		367,792			1,144,445	47,133,127	48,277,572
23. Water & Other Utilities	10,339		26,344			36,683	1,302,092	1,338,775
24. Wholesale Trade						0	108,476,400	108,476,400
25. Retail Trade	1,261,167	383,228	1,300,494	1,216,552		4,161,441	118,966,370	123,127,811
26. Finance, Insurance & Real Estate			1,143,238			1,143,238	2,182,659	3,325,897
27. Hotel Restaurant & Other Personal Services			855,982		21,778	877,760	1,363,634	2,241,394
28. Data Processing & Computer Services		75,566			25,136	100,702	58,969,546	59,070,248
29. Management & Consulting Services					9,657	9,657	70,961,740	70,971,397
30. Engineering, Architecture & Surveying Services		4,938,778			565,480	5,504,258	98,971,023	104,475,281
31. Other Business Services	17,290,459		46,792	200,643	652,625	18,190,519	108,303,884	126,494,403
32. Automobile & Other Repair Services			87,875	1,010,954		1,098,829	1,955,628	3,054,457
33. Amusement, Recreation & Video Services						0	383,037	383,037
34. Health, Education & Social Services			301,738	951,312	2,939,087	4,192,137	28,247,610	32,439,747
35. Government Services	3,346		2,454		305,183	310,983	5,424,396	5,735,379
36. Local Government	3,269,270		385,490	1,971		3,656,731	25,523,293	29,180,024
37. State Government	6,548,357		2,499,440	7,736		9,055,533	42,191,904	51,247,437
38. United States Department of Energy								
39. Households	102,887,165		16,911,932	189,823		119,988,920	1,135,443,744	1,255,432,664
Total New Mexico Expenditures	140,507,082	5,397,572	25,610,553	3,578,991	5,052,584	180,146,782	2,043,600,162	2,223,746,944
Total Operating and Capital Budget	140,507,082	5,397,572	28,523,925	3,578,991	5,052,584	183,060,154	2,861,548,510	3,044,608,664

a. Any transfer of money for services or products between specified activites is counted only in the activity of the last receiving agency.

Table 11. DOE NM Expenditures (in dollars) by Sector and Operating Budget, Contractors, FY 1995.

Sector	Lovelace Bio. & Env. Research Institute (ITRI)	Jacob's Engineering Group, Inc (UMTRA)	University of California (LANL)	Johnson Control (LANL)	Protection Technology Los Alamos (LANL)	M-K Ferguson Company, Inc (UMTRA)	ROSS Aviation Inc	Lockheed Martin (SNL)	Westinghouse Electric Corp (WIPP)	Allied Signal Aerospace	Other Contractors in New Mwexico(a)	Total Expenditures Contractors in New Mexico
1. Livestock & Livestock Products								5,000				5,000
2. Other Agricultural Products									1,144			1,144
3. Forestry & Fishery Products												
4. Agriculture, Forestry & Fishery Services			4,908					388,415				393,323
5. Mining, Crude Petroleum & Natural Gas			1,305,950					264,480	49,650			1,620,080
6. Construction	763,192		8,229,776					42,385,740	611,825			51,990,533
7. Ordnance & Chemical Manufacturing			59,680									59,680
8. Food & Kindred Products Manufacturing			49,303									49,303
9. Textiles Products & Apparel Manufacturing			25,411					11,535				36,946
10. Lumber & Wood Products Manufacturing			271,124					29,941				301,065
11. Paper & Publishing Manufacturing			278,408			671		892,945	39,585			1,211,609
12. Petroleum Refining & Products Manufacturing			1,348					286,201				287,549
13. Glass, Stone & Clay Products Manufacturing			123,725			792		11,765				136,282
14. Primary & Fabricated Metals Manufacturing			2,660,253			17		5,257,701	6,600	63,217		7,987,788
15. Computer, Office & Service Equipment Manufacturing								9,691,875				9,691,875
16. Electrical Equipment Manufacturing			5,643,642					3,830,312	12,577	129,137		9,615,668
17. Scientific Instruments Manufacturing			1,274,838					944,134	14,215	79,454		2,312,641
18. All Other Manufacturing			2,521,249					191,536		651,937	132,001	3,496,723
19. Motor Freight Transportation & Warehousing			83,100		17,591	2,651		216,729	27,668			327,739
20. All Other Transportation			356,268		135,094			3,247,485	24,432			3,763,279
21. Communication		9,457	1,842,649	642,774			22,818	10,051,141	227,618			12,596,457
22. Electric & Gas Utilities	381,201		12,540,869	4,175,184		15,629	33,343	15,344,809	1,175,443			33,666,478
23. Water & Other Utilities	223,291		11,729	26,119		1,944	9,218	767,726	4,655			1,044,682
24. Wholesale Trade			50,861,030			16,256		24,532,557	4,409,238			79,819,081
25. Retail Trade	1,868,986	128,673	56,179,678			256,575	263,995	38,899,912	7,935	415,726	4,037,801	101,859,281
26. Finance, Insurance & Real Estate	8,840	391,963	1,222,617	406,043	74,205	338,706	62,725	100,778	162,013	116		2,768,006
27. Hotel Restaurant & Other Personal Services		11,828	434,388	82,750		165,886		45,552				740,404
28. Data Processing & Computer Services	160,930	28,029	12,067,885	126,465		557		25,931,591	345,077			38,660,534
29. Management & Consulting Services	646,554	20,165	13,261,861		97,909	4,148		60,807,406	535,589		576,444	75,950,076
30. Engineering, Architecture & Surveying Services	22,100	7,176,613	28,018,355			37,135		33,904,999	793,179	23,303		69,975,684
31. Other Business Services	1,326,725	95,259	36,418,278		198,762	99,727	1,085,931	54,413,586	3,981,688	1,198,969	214,182	99,033,107
32. Automobile & Other Repair Services	46,703	425	816,001	2,477,044		10,399		826,575	74,794	49,828		4,301,769
33. Amusement, Recreation & Video Services		87,912	7,196			445		77,590				173,143
34. Health, Education & Social Services	54,278	1,933	4,641,559	2,429,372		12,373	48,161	29,569,626	1,100			36,758,402
35. Government Services		32,130	2,714,634	4,525,147		45,362		2,294,454	6,500			9,618,217
36. Local Government	29,662	351,491	403,070	2,192,146	271,166	348,242	32,674	15,184,398	1,568,556	358,245	35,844	20,775,494
37. State Government	44,493	642,570	940,496	2,575,461	1,276,075	630,590	49,819	23,716,659	2,352,833	985,019	53,767	33,267,782
38. United States Department of Energy (b)												
39. Households	8,406,572	3,254,941	518,418,004	66,320,029	23,873,985	4,199,798	7,622,743	495,995,662	35,516,703	12,888,087	840,126	1,177,136,650
Total New Mexico Expenditures	13,783,527	12,233,389	763,469,282	85,978,534	25,944,787	6,187,893	9,231,427	900,120,815	51,950,617	16,843,038	5,690,165	1,891,433,474
Total Operating and Capital Budget	17,417,175	14,600,000	1,184,863,810	(c)	(c)	6,187,893	15,367,528	1,459,362,626	78,348,897	18,496,473	5,690,165	2,800,374,567

a. Includes Chem Nuclear GeoTech, Inc., Martin Marietta Specialty Components, Inc.,Mason & Hanger-Silas Mason Co., Inc., Pantex, and EG & G Mound Applied Technologies, Rust Geotech, Inc.

b. Any transfer of money for services or products between specified activites is counted only in the activity of the last receiving agency.

c. Total Operating and Capital Budget for Johnson Control & Protection Technology - Los Alamos is included in the Los Alamos National Laboratory Budget.

Table 12. DOE NM Expenditures (in dollars) by Sector and Total Operating Budget, US DOE Offices and Total Expenditures, FY 1995.

Sector	USDOE Albuquerque Field Office	USDOE Idaho Operations	USDOE Nevada Field Office	USDOE Oak Ridge Field Office	Other USDOE Field Office	Total Expenditures by DOE Offices	Total Expenditures by Contractors	Total Expenditures by DOE In NM
1. Livestock & Livestock Products							5,000	5,000
2. Other Agricultural Products							1,144	1,144
3. Forestry & Fishery Products								
4. Agric., Forestry & Fishery Services							393,323	393,323
5. Mining, Crude Petroleum & Natural Gas							1,620,080	1,620,080
6. Construction	7,808,637				4,000	7,812,637	51,990,533	59,803,170
7. Ordnance & Chemical Manufacturing							59,680	59,680
8. Food & Kindred Products Manufacturing							49,303	49,303
9. Textiles Products & Apparel Manufacturing							36,946	36,946
10. Lumber & Wood Products Manufacturing							301,065	301,065
11. Paper & Publishing Manufacturing							1,211,609	1,211,609
12. Petroleum Refining & Products Manufacturing							287,549	287,549
13. Glass, Stone & Clay Products Manufacturing							136,282	136,282
14. Primary & Fabricated Metals Manufacturing					32,627	32,627	7,987,788	8,020,415
15. Computer, Office & Service Equipment Manufacturing							9,691,875	9,691,875
16. Electrical Equipment Manufacturing							9,615,668	9,615,668
17. Scientific Instruments Manufacturing							2,312,641	2,312,641
18. All Other Manufacturing			268,820		283,294	552,114	3,496,723	4,048,837
19. Motor Freight Transportation & Warehousing			2,386			2,386	327,739	330,125
20. All Other Transportation			11,908		73,516	85,424	3,763,279	3,848,703
21. Communication	2,251,182		165,662			2,416,844	12,596,457	15,013,301
22. Electric & Gas Utilities	891,839		193,042			1,084,881	33,666,478	34,751,359
23. Water & Other Utilities	9,743		25,464			35,207	1,044,682	1,079,889
24. Wholesale Trade							79,819,081	79,819,081
25. Retail Trade	1,424,226	295,524	250,194	1,620,564	4,382	3,594,890	101,859,281	105,454,171
26. Finance, Insurance & Real Estate			943,366			943,366	2,768,006	3,711,372
27. Hotel Restaurant & Other Personal Services			433,729	39,387	267,016	740,132	740,404	1,480,536
28. Data Processing & Computer Services		58,273			64,528	122,801	38,660,534	38,783,335
29. Management & Consulting Services					9,404,801	9,404,801	75,950,076	85,354,877
30. Engineering, Architecture & Surveying Services		3,808,517			6,591,443	10,399,960	69,975,684	80,375,644
31. Other Business Services	18,154,982			1,263,855	1,717,901	21,136,738	99,033,107	120,169,845
32. Automobile & Other Repair Services			145,179			145,179	4,301,769	4,446,948
33. Amusement, Recreation & Video Services							173,143	173,143
34. Health, Education & Social Services			97,738	10,547	4,258,951	4,367,236	36,758,402	41,125,638
35. Government Services	3,513		2,454	1,207,291		1,213,258	9,618,217	10,831,475
36. Local Government	4,261,453		287,892		425	4,549,770	20,775,494	25,325,263
37. State Government	6,392,180		596,337	2,191	637	6,991,345	33,267,782	40,259,127
38. United States Department of Energy (a)								
39. Households	86,924,701		5,201,397	176,261	21,316	92,323,675	1,177,136,650	1,269,460,325
Total New Mexico Expenditures	128,122,456	4,162,314	8,625,568	4,320,096	22,724,837	167,955,271	1,891,433,474	2,059,388,745
Total Operating and Capital Budget	129,027,676	4,162,314	9,681,006	6,794,548	22,724,837	172,390,381	2,800,374,567	2,972,764,948

a. Any transfer of money for services or products between specified activites is counted only in the activity of the last receiving agency.

for economic activity and income and employment can be derived.

COEFFICIENTS

The Direct Coefficients (expenditures) in the DOE/New Mexico column (sector 38) constitute the DOE/New Mexico in-state production function (Table 13). These were calculated by dividing each in-state expenditure in sectors 1 through 39 of the input-output tables by the FY 1995 DOE/New Mexico total expenditures (Tables 11 and 12).

The direct coefficient matrix shows the amount of input (from New Mexico) required for each industry from all industries to produce one dollar's worth of output (Table 14). The direct, indirect, and induced coefficient matrix identifies the total impact generated from a $1 increase in the activity of a specific industry (Table 15).

As discussed below, the regional modeling technique employed for the DOE economic studies produces a direct coefficients matrix that contains three state and local government sectors—one for government services (enterprise) and one each for state and local non-service (non-enterprise) activities. A review of the national modeling techniques employed by the BEA strongly indicates that state and local government tax (non-enterprise) supported activities for a state like New Mexico are under represented. Such "under representation" will create an upward bias in the regional model results when New Mexico government sectors, calculated from an empirical study, are added to the direct coefficients matrix. To neutralize this upward bias, the direct coefficients for sectors 1 through 35 (private sectors), sector 36 (government services), and sector 39 (households or labor costs) have been proportionally adjusted. These adjustments were made relative to the state and local tax coefficients for each of the 37 affected sectors in the regional model. The adjustments will assure there is no upward bias in the model as a result of adding empirically derived state and local tax coefficients to the average production function for industries represented in each of the I/O model sectors, and that the regional model direct coefficients matrix does not contain a column (production function representation) that sums to more than 1.

STATE AND LOCAL GOVERNMENT IMPACTS

During January and February, 1993, an extensive study of state and local government taxes impacting New Mexico businesses was completed. The overall objective of this study was to estimate the direct tax and expenditure patterns coefficients for local and state governments for the current 1987-based DOE/NMSU I/O model. All possible avenues of state and local taxation and expenditures within the state of New Mexico were examined. Taxes imposed on businesses and individuals, and fees paid annually imposed on businesses and professionals were the avenues investigated during the data collection process.

In the tax study, an effort was made to examine all possible avenues of state and local taxation on businesses operating within the state of New Mexico. It is important to note that with approximately 100 communities, nearly 90 school districts, numerous special taxing districts, 33 counties, and the state authority, the actual taxes (or tax rates) affecting a particular business will vary by location throughout the state. The tax study results are therefore averages considering all levied taxes. There were about 15 significant tax categories, with the major ones being; gross receipts tax, property tax, personal income tax, corporate income tax, gasoline tax, oil and gas taxes (several), etc. To estimate the economic impact of taxes, it is important not only to categorize the taxing entities (state or local government), but to also know which governmental unit is the final recipient of the collected taxes. For example, the state collects the gross receipts tax but sends to the local government units their portion of the collection. Thus, gross receipts tax revenues must be divided between the two in accordance with final disbursement. Also, it must be noted the taxed entity is not the one we may commonly think it is. Consider the gross receipts tax that the consumer pays on groceries, clothing, medicine, and other purchases: while the consumer pays the tax initially, the reporting entity is the business that collects the tax from the consumer. Therefore, the gross receipts tax is a business tax even though we may feel it is largely levied on individuals. The tax impacts are estimated for the reporting units, which may be either businesses or individuals.

Table 13. DOE NM Direct Coefficients, FY 1995

Sector	Direct Coefficient
1. Livestock & Livestock Products	0.00000
2. Other Agricultural Products	0.00000
3. Forestry & Fishery Products	0.00000
4. Agric., Forestry & Fishery Services	0.00013
5. Mining, Crude Petroleum & Natural Gas	0.00054
6. Construction	0.02012
7. Ordnance & Chemical Manufacturing	0.00002
8. Food & Kindred Products Manufacturing	0.00002
9. Textiles Products & Apparel Manufacturing	0.00001
10. Lumber & Wood Products Manufacturing	0.00010
11. Paper & Publishing Manufacturing	0.00041
12. Petroleum Refining & Products Manufacturing	0.00010
13. Glass, Stone & Clay Products Manufacturing	0.00005
14. Primary & Fabricated Metals Manufacturing	0.00270
15. Computer, Office & Service Equipment Manufacturing	0.00326
16. Electrical Equipment Manufacturing	0.00323
17. Scientific Instruments Manufacturing	0.00078
18. All Other Manufacturing	0.00136
19. Motor Freight Transportation & Warehousing	0.00011
20. All Other Transportation	0.00129
21. Communication	0.00505
22. Electric & Gas Utilities	0.01169
23. Water & Other Utilities	0.00036
24. Wholesale Trade	0.02685
25. Retail Trade	0.03547
26. Finance, Insurance & Real Estate	0.00125
27. Hotel Restaurant & Other Personal Services	0.00050
28. Data Processing & Computer Services	0.01305
29. Management & Consulting Services	0.02871
30. Engineering, Architecture & Surveying Services	0.02704
31. Other Business Services	0.04042
32. Automobile & Other Repair Services	0.00150
33. Amusement, Recreation & Video Services	0.00006
34. Health, Education & Social Services	0.01383
35. Government Services	0.00364
36. Local Government	0.00852
37. State Government	0.01354
38. United States Department of Energy	0.00000
39. Households	0.42703
Total New Mexico Expenditures	0.69275
Total Operating and Capital Budget	1.00000

a. Any transfer of money for services or products between specified activites is counted only in the activity of the last receiving agency.

Table 14. Direct Coefficients, Input-Output Tables, US DOE, State of New Mexico, FY 1995.

			INDUSTRY PURCHASING									
			1	2	3	4	5	6	7	8	9	10
	Livestock and Livestock Products	1	0.24864	0.01256	0.00389	0.01422	0.00000	0.00000	0.00009	0.06888	0.00020	0.00000
	Other Agricultural Products	2	0.27037	0.02704	0.00000	0.04618	0.00000	0.00006	0.00019	0.01686	0.00259	0.00000
	Forestry and Fishery Products	3	0.00000	0.00000	0.01447	0.00103	0.00000	0.00000	0.00009	0.00112	0.00202	0.00790
	Agricultural, Forestry, and Fishery Services	4	0.02724	0.09339	0.24263	0.00054	0.00005	0.00086	0.00003	0.00003	0.00000	0.00014
	Mining, Crude Petroleum, and Natural Gas	5	0.00005	0.00045	0.00000	0.00015	0.04577	0.00106	0.04317	0.00015	0.00006	0.00042
	Construction	6	0.00000	0.00000	0.00000	0.00000	0.01231	0.00483	0.00000	0.00000	0.00000	0.00000
	Ordnance & Chemical Manufacturing	7	0.00171	0.03617	0.00765	0.14728	0.00202	0.00530	0.08314	0.00144	0.00031	0.00502
	Food and kindred Products	8	0.02750	0.00000	0.01350	0.00058	0.00000	0.00000	0.00034	0.04929	0.00000	0.00000
	Textile Products and Apparel	9	0.00001	0.00047	0.00078	0.00074	0.00005	0.00006	0.00002	0.00002	0.06179	0.00044
	Lumber and Wood Products	10	0.00017	0.00018	0.00000	0.00000	0.00036	0.00701	0.00003	0.00020	0.00015	0.10747
	Paper and Publishing	11	0.00010	0.00051	0.00007	0.00082	0.00023	0.00006	0.00149	0.00436	0.00067	0.00050
	Petroleum Refining and Products	12	0.00263	0.01056	0.00500	0.00697	0.00585	0.00896	0.00201	0.00147	0.00122	0.00383
	Glass, Stone and Clay Products	13	0.00000	0.00108	0.00006	0.00040	0.00238	0.01766	0.00101	0.00003	0.00004	0.00304
	Primary and Fabricated Metals	14	0.00090	0.00132	0.00086	0.00083	0.00603	0.01619	0.00116	0.00029	0.00043	0.00669
	Computer, Office and Service equipment	15	0.00000	0.00000	0.00000	0.00000	0.00000	0.00014	0.00001	0.00000	0.00000	0.00002
	Electrical Equipment	16	0.00002	0.00004	0.00000	0.00015	0.00042	0.00217	0.00986	0.00000	0.00000	0.00013
I	Scientific Instruments	17	0.00000	0.00000	0.00068	0.00004	0.00007	0.00046	0.00296	0.00006	0.00007	0.00020
N	All Other Manufacturing	18	0.00027	0.00061	0.00009	0.00062	0.00061	0.00097	0.02941	0.00615	0.00181	0.00341
D	Transportation and Warehousing	19	0.01882	0.01294	0.00228	0.00927	0.00351	0.00660	0.02122	0.01121	0.00343	0.01328
U	All Other Transportation	20	0.00912	0.00407	0.00179	0.02389	0.00513	0.00667	0.01088	0.00574	0.00186	0.01101
S	Communication	21	0.00178	0.00197	0.00028	0.00001	0.00087	0.00131	0.00257	0.00128	0.00110	0.00131
T	Electric and Gas Utilities	22	0.00843	0.00802	0.00087	0.00389	0.03622	0.00169	0.03276	0.01228	0.01039	0.02204
R	Water and Other Utilities	23	0.00125	0.00407	0.00115	0.00000	0.00262	0.00041	0.00266	0.00135	0.00072	0.00231
Y	Wholesale Trade	24	0.03786	0.03047	0.01083	0.05998	0.00897	0.01722	0.02655	0.04106	0.02940	0.05274
	Retail Trade	25	0.00075	0.00222	0.00004	0.00275	0.00024	0.00759	0.00017	0.00031	0.00024	0.00068
S	Finance, Insurance and Real Estate	26	0.05318	0.08560	0.01612	0.01255	0.01136	0.00854	0.00895	0.00714	0.01033	0.01127
E	Hotel Restaurant and Other Personal Services	27	0.00072	0.00079	0.00253	0.01498	0.00199	0.00080	0.00238	0.00255	0.00438	0.00449
L	Data Processing and Computer Services	28	0.00000	0.00000	0.00150	0.00217	0.00096	0.00017	0.00015	0.00026	0.00010	0.00016
L	Management and Consulting Services	29	0.00000	0.00000	0.00083	0.00308	0.00092	0.00084	0.00544	0.00140	0.00149	0.00272
I	Engineering and Related Services	30	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
N	Other Bussiness Services	31	0.00163	0.00276	0.03455	0.01437	0.00562	0.00707	0.02102	0.02281	0.01625	0.01822
G	Automobile and Other Repair Services	32	0.00475	0.01080	0.01003	0.02753	0.00557	0.00422	0.00460	0.00493	0.00541	0.00580
	Amusements, Recreation and Video Services	33	0.00000	0.00000	0.00000	0.01854	0.00004	0.00001	0.00004	0.00003	0.00012	0.00011
	Health, Education and Social Services	34	0.00850	0.00000	0.00091	0.00096	0.00036	0.00001	0.00042	0.00039	0.00051	0.00107
	Government Services	35	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Local Government	36	0.00756	0.00745	0.01936	0.01097	0.01370	0.02218	0.01329	0.00885	0.01034	0.00955
	State Government	37	0.00854	0.00843	0.20093	0.01130	0.10790	0.03098	0.01526	0.01528	0.01024	0.00889
	United States Department of Energy	38	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Households	39	0.05384	0.09066	0.07127	0.34170	0.17679	0.30410	0.21301	0.13411	0.25279	0.26625
	*** Column Sums ***		0.79633	0.45462	0.66495	0.77851	0.45891	0.48620	0.55637	0.42135	0.43046	0.57112

Table 14. Direct Coefficients, Input-Output Tables, US DOE, State of New Mexico, FY 1995 (continued).

			INDUSTRY PURCHASING									
			11	12	13	14	15	16	17	18	19	20
	Livestock and Livestock Products	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000
	Other Agricultural Products	2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00007	0.00000	0.00000
	Forestry and Fishery Products	3	0.00003	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Agricultural, Forestry, and Fishery Services	4	0.00002	0.00001	0.00005	0.00002	0.00001	0.00004	0.00004	0.00005	0.00004	0.00006
	Mining, Crude Petroleum, and Natural Gas	5	0.00032	0.53511	0.05429	0.10273	0.00019	0.00002	0.00017	0.00033	0.00000	0.00029
	Construction	6	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Ordnance & Chemical Manufacturing	7	0.00155	0.00239	0.00390	0.00191	0.00063	0.00374	0.00180	0.00411	0.00013	0.00030
	Food and kindred Products	8	0.00000	0.00011	0.00001	0.00000	0.00000	0.00004	0.00035	0.00002	0.00000	0.00047
	Textile Products and Apparel	9	0.00004	0.00000	0.00007	0.00005	0.00004	0.00012	0.00043	0.00042	0.00006	0.00036
	Lumber and Wood Products	10	0.00082	0.00033	0.00137	0.00059	0.00027	0.00002	0.00026	0.00182	0.00001	0.00000
	Paper and Publishing	11	0.04310	0.00009	0.00141	0.00031	0.00037	0.00039	0.00103	0.00094	0.00096	0.00157
	Petroleum Refining and Products	12	0.00221	0.07107	0.00468	0.00222	0.00080	0.00059	0.00193	0.00194	0.04754	0.06337
	Glass, Stone and Clay Products	13	0.00002	0.00008	0.12469	0.00108	0.00011	0.00081	0.00336	0.00190	0.00004	0.00033
	Primary and Fabricated Metals	14	0.00048	0.00040	0.00140	0.08898	0.01595	0.02449	0.01128	0.04860	0.00062	0.00074
	Computer, Office and Service equipment	15	0.00007	0.00000	0.00000	0.00002	0.01738	0.00013	0.00022	0.00017	0.00001	0.00000
	Electrical Equipment	16	0.00004	0.00001	0.00006	0.00272	0.04633	0.08192	0.07443	0.00318	0.00024	0.00113
I	Scientific Instruments	17	0.00054	0.00005	0.00009	0.00106	0.00609	0.00078	0.01294	0.00114	0.00004	0.00017
N	All Other Manufacturing	18	0.00291	0.00109	0.00108	0.00458	0.00478	0.00784	0.00568	0.04888	0.00056	0.01768
D	Transportation and Warehousing	19	0.00844	0.00384	0.05788	0.00927	0.00285	0.00361	0.00425	0.00931	0.14140	0.00296
U	All Other Transportation	20	0.01350	0.04031	0.01673	0.00622	0.00990	0.00714	0.00528	0.00631	0.00844	0.06838
S	Communication	21	0.00237	0.00093	0.00504	0.00261	0.00255	0.00269	0.00346	0.00201	0.00845	0.00838
T	Electric and Gas Utilities	22	0.00906	0.02032	0.03288	0.02407	0.00833	0.01838	0.01104	0.01161	0.00833	0.00765
R	Water and Other Utilities	23	0.00090	0.00134	0.00392	0.00148	0.00116	0.00073	0.00101	0.00385	0.00035	0.00299
Y	Wholesale Trade	24	0.02093	0.03789	0.02357	0.03268	0.05820	0.03559	0.03097	0.04443	0.01254	0.01710
	Retail Trade	25	0.00067	0.00014	0.00065	0.00046	0.00021	0.00012	0.00054	0.00053	0.02671	0.00430
S	Finance, Insurance and Real Estate	26	0.01087	0.01099	0.01111	0.01048	0.01106	0.01855	0.01424	0.01146	0.02619	0.04450
E	Hotel Restaurant and Other Personal Services	27	0.00728	0.00058	0.00352	0.00451	0.00730	0.00711	0.00614	0.00805	0.00645	0.02030
L	Data Processing and Computer Services	28	0.00130	0.00043	0.00099	0.00086	0.00059	0.00103	0.00055	0.00054	0.00137	0.00500
L	Management and Consulting Services	29	0.00328	0.00368	0.00220	0.00205	0.00230	0.00279	0.00335	0.00357	0.00489	0.00501
I	Engineering and Related Services	30	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
N	Other Bussiness Services	31	0.02487	0.00298	0.01749	0.01489	0.01256	0.01666	0.02364	0.02405	0.01045	0.02370
G	Automobile and Other Repair Services	32	0.00914	0.00355	0.00618	0.00792	0.00322	0.00262	0.00856	0.00833	0.03674	0.01021
	Amusements, Recreation and Video Services	33	0.00011	0.00002	0.00003	0.00008	0.00005	0.00057	0.00044	0.00054	0.00011	0.00035
	Health, Education and Social Services	34	0.00115	0.00034	0.00063	0.00065	0.00030	0.00169	0.00248	0.00161	0.00039	0.00071
	Government Services	35	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Local Government	36	0.02130	0.01341	0.01080	0.01137	0.01298	0.01381	0.00808	0.01298	0.00800	0.01209
	State Government	37	0.02889	0.01545	0.01102	0.01199	0.01282	0.01614	0.00638	0.01282	0.03340	0.01322
	United States Department of Energy	38	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Households	39	0.32173	0.03888	0.32043	0.30217	0.31175	0.34732	0.26902	0.37181	0.37181	0.39879
	*** Column Sums ***		0.53792	0.80583	0.71814	0.65005	0.55107	0.61745	0.51332	0.64741	0.75628	0.73212

Table 14. Direct Coefficients, Input-Output Tables, US DOE, State of New Mexico, FY 1995 (continued).

			INDUSTRY PURCHASING									
			21	22	23	24	25	26	27	28	29	30
	Livestock and Livestock Products	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00016	0.00000	0.00030	0.00000
	Other Agricultural Products	2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00430	0.00000	0.00000	0.00000
	Forestry and Fishery Products	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Agricultural, Forestry, and Fishery Services	4	0.00004	0.00008	0.00040	0.00030	0.00016	0.00110	0.00085	0.00005	0.00018	0.00000
	Mining, Crude Petroleum, and Natural Gas	5	0.00000	0.14773	0.00043	0.00005	0.00002	0.00000	0.00006	0.00000	0.00000	0.00000
	Construction	6	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Ordnance & Chemical Manufacturing	7	0.00030	0.00042	0.00805	0.00004	0.00003	0.00008	0.00103	0.00002	0.00246	0.00000
	Food and kindred Products	8	0.00000	0.00000	0.00004	0.00003	0.00042	0.00000	0.06575	0.00000	0.00066	0.00000
	Textile Products and Apparel	9	0.00015	0.00001	0.00005	0.00009	0.00006	0.00000	0.00154	0.00000	0.00021	0.00000
	Lumber and Wood Products	10	0.00000	0.00000	0.00628	0.00021	0.00005	0.00001	0.00006	0.00007	0.00008	0.00000
	Paper and Publishing	11	0.00111	0.00023	0.00055	0.00477	0.00118	0.00299	0.00151	0.01304	0.00547	0.00000
	Petroleum Refining and Products	12	0.00053	0.01525	0.02204	0.00589	0.00462	0.00106	0.00191	0.00180	0.00396	0.00000
	Glass, Stone and Clay Products	13	0.00003	0.00003	0.00093	0.00015	0.00001	0.00006	0.00181	0.00002	0.00102	0.00000
	Primary and Fabricated Metals	14	0.00034	0.00056	0.00108	0.00035	0.00025	0.00009	0.00026	0.00008	0.00068	0.00000
	Computer, Office and Service equipment	15	0.00010	0.00006	0.00001	0.00002	0.00004	0.00002	0.00000	0.00213	0.00019	0.00000
	Electrical Equipment	16	0.01223	0.00026	0.00055	0.00011	0.00006	0.00048	0.00006	0.02770	0.02925	0.00000
I	Scientific Instruments	17	0.00029	0.00014	0.00905	0.00008	0.00003	0.00010	0.00003	0.00018	0.00014	0.00000
N	All Other Manufacturing	18	0.00088	0.00012	0.00966	0.00102	0.00081	0.00077	0.00354	0.00347	0.00216	0.00000
D	Transportation and Warehousing	19	0.00105	0.00170	0.00543	0.00193	0.00233	0.00926	0.00557	0.00159	0.00329	0.00000
U	All Other Transportation	20	0.00344	0.01941	0.00570	0.01045	0.00337	0.00506	0.00303	0.00919	0.04016	0.00000
S	Communication	21	0.10339	0.00070	0.00420	0.00885	0.00738	0.00944	0.00441	0.01760	0.01139	0.00000
T	Electric and Gas Utilities	22	0.00232	0.14057	0.04571	0.01130	0.02462	0.00363	0.02672	0.00521	0.00758	0.00000
R	Water and Other Utilities	23	0.00497	0.00102	0.05217	0.00069	0.00154	0.00102	0.00304	0.00022	0.00036	0.00000
Y	Wholesale Trade	24	0.00430	0.00634	0.02548	0.01866	0.00323	0.00235	0.02901	0.01195	0.01075	0.00000
	Retail Trade	25	0.00021	0.00032	0.00495	0.00169	0.00203	0.00044	0.00042	0.00064	0.00173	0.00000
S	Finance, Insurance and Real Estate	26	0.02403	0.01305	0.06834	0.03440	0.06273	0.16463	0.05431	0.03807	0.05218	0.00000
E	Hotel Restaurant and Other Personal Services	27	0.00495	0.00116	0.00802	0.01964	0.01542	0.01525	0.00769	0.00881	0.02343	0.00000
L	Data Processing and Computer Services	28	0.00384	0.00257	0.00350	0.00043	0.00214	0.01051	0.00040	0.05343	0.02191	0.00000
L	Management and Consulting Services	29	0.00380	0.00090	0.00443	0.00600	0.00570	0.01202	0.00824	0.00665	0.05971	0.00000
I	Engineering and Related Services	30	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
N	Other Bussiness Services	31	0.01062	0.00275	0.01140	0.03502	0.05928	0.03235	0.02864	0.01857	0.04650	0.00000
G	Automobile and Other Repair Services	32	0.00834	0.00497	0.01393	0.02790	0.02105	0.00999	0.01285	0.01888	0.02417	0.00000
	Amusements, Recreation and Video Services	33	0.08604	0.00003	0.00010	0.00208	0.00039	0.00031	0.00289	0.00015	0.00047	0.00000
	Health, Education and Social Services	34	0.00102	0.00064	0.00065	0.00121	0.00087	0.00132	0.00180	0.00195	0.00601	0.00000
	Government Services	35	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Local Government	36	0.02595	0.02215	0.02512	0.01471	0.02379	0.02179	0.02688	0.02225	0.02534	0.02308
	State Government	37	0.03919	0.03084	0.03640	0.05183	0.03354	0.11227	0.03849	0.03052	0.03578	0.03293
	United States Department of Energy	38	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Households	39	0.38183	0.09370	0.19831	0.39283	0.39626	0.26520	0.33224	0.39713	0.39713	0.39713
	*** Column Sums ***		0.72527	0.50770	0.57297	0.65272	0.67340	0.68361	0.66950	0.69136	0.81465	0.45314

Table 14. Direct Coefficients, Input-Output Tables, US DOE, State of New Mexico, FY 1995 (continued).

			INDUSTRY PURCHASING								
			31	32	33	34	35	36	37	38	39	*Row Sums*
	Livestock and Livestock Products	1	0.00000	0.00000	0.00025	0.00008	0.00000	0.00151	0.00290	0.00000	0.00270	0.35640
	Other Agricultural Products	2	0.00000	0.00000	0.00012	0.00041	0.00000	0.00143	0.00273	0.00000	0.00424	0.37660
	Forestry and Fishery Products	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00073	0.00145	0.00000	0.00017	0.02900
	Agricultural, Forestry, and Fishery Services	4	0.00013	0.00037	0.00824	0.00109	0.00000	0.00084	0.00161	0.00013	0.00013	0.38094
	Mining, Crude Petroleum, and Natural Gas	5	0.00000	0.00004	0.00003	0.00004	0.00000	0.00000	0.00000	0.00055	0.00010	0.93379
	Construction	6	0.00000	0.00000	0.00000	0.00000	0.00000	0.08996	0.16832	0.02012	0.00340	0.29893
	Ordnance & Chemical Manufacturing	7	0.00004	0.00365	0.00043	0.00551	0.00000	0.00174	0.00028	0.00002	0.00000	0.33459
	Food and kindred Products	8	0.00002	0.00000	0.00344	0.00682	0.00000	0.00568	0.01043	0.00002	0.02022	0.20573
	Textile Products and Apparel	9	0.00011	0.00056	0.00093	0.00090	0.00000	0.00087	0.00121	0.00001	0.00419	0.07687
	Lumber and Wood Products	10	0.00006	0.00003	0.00018	0.00085	0.00000	0.00000	0.00000	0.00010	0.00002	0.12906
	Paper and Publishing	11	0.00379	0.00070	0.00244	0.01463	0.00000	0.01831	0.00532	0.00041	0.00190	0.13733
	Petroleum Refining and Products	12	0.00164	0.00861	0.00122	0.00365	0.00000	0.00998	0.00671	0.00010	0.01674	0.35056
	Glass, Stone and Clay Products	13	0.00002	0.00121	0.00001	0.00081	0.00000	0.00142	0.00235	0.00005	0.00025	0.16830
	Primary and Fabricated Metals	14	0.00032	0.00379	0.00032	0.00023	0.00000	0.01605	0.00195	0.00270	0.00025	0.25693
	Computer, Office and Service equipment	15	0.00009	0.00026	0.00000	0.00001	0.00000	0.00065	0.00000	0.00326	0.00988	0.03491
	Electrical Equipment	16	0.00336	0.00962	0.00027	0.00063	0.00000	0.00710	0.00323	0.00323	0.00059	0.32158
I	Scientific Instruments	17	0.00034	0.00017	0.00022	0.00499	0.00000	0.00600	0.00065	0.00078	0.00005	0.05068
N	All Other Manufacturing	18	0.00103	0.00528	0.00240	0.00585	0.00000	0.00754	0.00294	0.00136	0.00136	0.18922
D	Transportation and Warehousing	19	0.00131	0.00382	0.00204	0.00321	0.00000	0.00944	0.00061	0.00011	0.00261	0.40167
U	All Other Transportation	20	0.00495	0.00373	0.00345	0.00679	0.00000	0.01170	0.01687	0.00129	0.00492	0.41587
S	Communication	21	0.00997	0.00672	0.00595	0.00674	0.00000	0.02956	0.01998	0.00505	0.01684	0.31915
T	Electric and Gas Utilities	22	0.00451	0.01047	0.02087	0.01742	0.00000	0.01845	0.02022	0.01169	0.03040	0.68996
R	Water and Other Utilities	23	0.00053	0.00051	0.00211	0.00147	0.00000	0.00386	0.00643	0.00036	0.00369	0.11825
Y	Wholesale Trade	24	0.00445	0.02400	0.00548	0.01584	0.00000	0.00835	0.01133	0.02685	0.02514	0.86249
	Retail Trade	25	0.00070	0.01789	0.00063	0.00072	0.00000	0.01504	0.01753	0.03547	0.21406	0.36379
S	Finance, Insurance and Real Estate	26	0.03827	0.04560	0.05997	0.07103	0.00000	0.07003	0.07244	0.00125	0.12181	1.38660
E	Hotel Restaurant and Other Personal Services	27	0.01607	0.01413	0.01031	0.01238	0.00000	0.02603	0.01159	0.00050	0.06177	0.36400
L	Data Processing and Computer Services	28	0.00958	0.00031	0.00327	0.00518	0.00000	0.01562	0.00696	0.01305	0.00311	0.17392
L	Management and Consulting Services	29	0.01749	0.00623	0.00911	0.00989	0.00000	0.01952	0.01170	0.02871	0.00000	0.25994
I	Engineering and Related Services	30	0.00000	0.00000	0.00000	0.00000	0.00000	0.01692	0.00954	0.02704	0.00000	0.05350
N	Other Bussiness Services	31	0.04361	0.01974	0.04927	0.02550	0.00000	0.01822	0.01312	0.04042	0.00311	0.77371
G	Automobile and Other Repair Services	32	0.01519	0.02443	0.01952	0.01423	0.00000	0.01302	0.00980	0.00150	0.03517	0.45504
	Amusements, Recreation and Video Services	33	0.00057	0.00054	0.10216	0.00295	0.00000	0.00781	0.00348	0.00006	0.02161	0.25281
	Health, Education and Social Services	34	0.00406	0.00271	0.00387	0.01011	0.00000	0.01996	0.01669	0.01383	0.06099	0.17077
	Government Services	35	0.00000	0.00000	0.00000	0.00000	0.00000	0.00903	0.00322	0.00364	0.01507	0.03096
	Local Government	36	0.02273	0.02453	0.02576	0.02668	0.00000	0.00000	0.00000	0.01106	0.00749	0.59741
	State Government	37	0.03234	0.03440	0.05215	0.03949	0.00000	0.00000	0.00000	0.01770	0.00256	1.20032
	United States Department of Energy	38	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Households	39	0.34695	0.21971	0.31840	0.51886	0.40719	0.41233	0.41423	0.42703	0.02075	11.29543
	*** Column Sums ***		0.58424	0.49377	0.71485	0.83499	0.40719	0.89470	0.87781	0.69945	0.71729	

Table 15. Direct, Indirect, and Induced Coefficients, Input-Output Tables, US DOE, State of New Mexico, FY 1995.

			INDUSTRY PURCHASING								
			1	2	3	4	5	6	7	8	9	10
	Livestock and Livestock Products	1	1.34570	0.02220	0.01696	0.02592	0.00395	0.00444	0.00419	0.10040	0.00396	0.00452
	Other Agricultural Products	2	0.38093	1.04101	0.02098	0.05982	0.00424	0.00495	0.00469	0.04881	0.00695	0.00501
	Forestry and Fishery Products	3	0.00036	0.00030	1.01552	0.00140	0.00036	0.00034	0.00034	0.00139	0.00239	0.00923
	Agricultural, Forestry, and Fishery Services	4	0.07314	0.09859	0.25011	1.00830	0.00141	0.00225	0.00134	0.00816	0.00191	0.00371
	Mining, Crude Petroleum, and Natural Gas	5	0.02488	0.02439	0.02609	0.03696	1.07394	0.02671	0.07442	0.01566	0.01590	0.02627
	Construction	6	0.01702	0.01333	0.05035	0.02005	0.04332	1.02343	0.01704	0.01220	0.01226	0.01529
	Ordnance & Chemical Manufacturing	7	0.03043	0.05782	0.05099	0.16588	0.00385	0.00757	1.09243	0.00584	0.00177	0.00811
	Food and kindred Products	8	0.05376	0.01296	0.03585	0.02642	0.01563	0.01835	0.01726	1.06646	0.01532	0.01889
	Textile Products and Apparel	9	0.00275	0.00266	0.00442	0.00499	0.00264	0.00320	0.00289	0.00203	1.06843	0.00369
	Lumber and Wood Products	10	0.00067	0.00049	0.00061	0.00043	0.00094	0.00825	0.00044	0.00050	0.00042	1.12075
	Paper and Publishing	11	0.00535	0.00436	0.00671	0.00738	0.00452	0.00470	0.00615	0.00815	0.00446	0.00534
	Petroleum Refining and Products	12	0.02626	0.02609	0.02775	0.03372	0.02235	0.02747	0.02117	0.01508	0.01555	0.02399
	Glass, Stone and Clay Products	13	0.00163	0.00227	0.00265	0.00220	0.00464	0.02149	0.00258	0.00090	0.00091	0.00499
	Primary and Fabricated Metals	14	0.00430	0.00361	0.00505	0.00458	0.00969	0.02048	0.00611	0.00246	0.00233	0.01069
	Computer, Office and Service equipment	15	0.00491	0.00412	0.00626	0.00839	0.00497	0.00648	0.00578	0.00396	0.00525	0.00646
	Electrical Equipment	16	0.00328	0.00306	0.00508	0.00621	0.00346	0.00548	0.01518	0.00223	0.00241	0.00333
I	Scientific Instruments	17	0.00082	0.00073	0.00184	0.00145	0.00078	0.00125	0.00403	0.00059	0.00064	0.00098
N	All Other Manufacturing	18	0.00519	0.00510	0.00633	0.01070	0.00388	0.00468	0.03718	0.00938	0.00464	0.00775
D	Transportation and Warehousing	19	0.04420	0.02446	0.01521	0.02540	0.01052	0.01614	0.03400	0.02146	0.00972	0.02473
U	All Other Transportation	20	0.02900	0.01743	0.02535	0.04377	0.01791	0.01920	0.02517	0.01630	0.01129	0.02576
S	Communication	21	0.02236	0.01759	0.02619	0.02770	0.01922	0.02174	0.02226	0.01550	0.01762	0.02225
T	Electric and Gas Utilities	22	0.05070	0.03897	0.04726	0.06184	0.07642	0.04066	0.07879	0.04097	0.04281	0.06715
R	Water and Other Utilities	23	0.00731	0.00773	0.00720	0.00642	0.00705	0.00486	0.00734	0.00468	0.00424	0.00709
Y	Wholesale Trade	24	0.09355	0.05977	0.06014	0.10510	0.03328	0.04590	0.05719	0.06766	0.05363	0.08833
	Retail Trade	25	0.10968	0.09235	0.13968	0.18434	0.10953	0.14478	0.12531	0.08651	0.11353	0.13998
S	Finance, Insurance and Real Estate	26	0.23699	0.20020	0.17911	0.20224	0.12764	0.14259	0.13630	0.10684	0.12148	0.15077
E	Hotel Restaurant and Other Personal Services	27	0.04509	0.03737	0.05957	0.08246	0.04227	0.05025	0.04892	0.03545	0.04554	0.05615
L	Data Processing and Computer Services	28	0.00725	0.00597	0.01118	0.01117	0.00726	0.00674	0.00675	0.00500	0.00544	0.00697
L	Management and Consulting Services	29	0.00922	0.00761	0.01357	0.01485	0.00843	0.00847	0.01399	0.00742	0.00780	0.01122
I	Engineering and Related Services	30	0.00128	0.00098	0.00327	0.00147	0.00199	0.00143	0.00124	0.00091	0.00092	0.00113
N	Other Bussiness Services	31	0.03541	0.02923	0.07485	0.05849	0.02977	0.03515	0.05127	0.04529	0.04034	0.05086
G	Automobile and Other Repair Services	32	0.04476	0.03992	0.05589	0.07730	0.03439	0.03889	0.03878	0.03030	0.03445	0.04336
	Amusements, Recreation and Video Services	33	0.01654	0.01440	0.02455	0.04493	0.01500	0.01838	0.01702	0.01194	0.01526	0.01881
	Health, Education and Social Services	34	0.04436	0.02757	0.04574	0.05576	0.03451	0.04151	0.03833	0.02737	0.03462	0.04304
	Government Services	35	0.00780	0.00650	0.01049	0.01304	0.00813	0.01000	0.00905	0.00623	0.00818	0.01002
	Local Government	36	0.03666	0.02772	0.04828	0.04444	0.03329	0.04362	0.03704	0.02606	0.02873	0.03409
	State Government	37	0.06951	0.05408	0.25764	0.07546	0.14997	0.07202	0.06409	0.04923	0.04554	0.05747
	United States Department of Energy	38	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Households	39	0.48084	0.40314	0.61212	0.82256	0.48729	0.62234	0.56489	0.38753	0.51610	0.63200
	*** Column Sums ***		3.37394	2.43607	3.25084	3.38354	2.45842	2.57616	2.69092	2.29687	2.32274	2.77019

Table 15. Direct, Indirect, and Induced Coefficients, Input-Output Tables, US DOE, State of New Mexico, FY 1995 (continued).

			INDUSTRY PURCHASING								
			11	12	13	14	15	16	17	18	19	20
	Livestock and Livestock Products	1	0.00481	0.00385	0.00554	0.00495	0.00471	0.00525	0.00424	0.00554	0.00628	0.00625
	Other Agricultural Products	2	0.00528	0.00414	0.00610	0.00544	0.00519	0.00578	0.00465	0.00617	0.00689	0.00685
	Forestry and Fishery Products	3	0.00033	0.00033	0.00033	0.00030	0.00027	0.00030	0.00023	0.00033	0.00038	0.00035
	Agricultural, Forestry, and Fishery Services	4	0.00150	0.00137	0.00176	0.00154	0.00145	0.00164	0.00133	0.00174	0.00201	0.00199
	Mining, Crude Petroleum, and Natural Gas	5	0.02133	0.63090	0.09937	0.14438	0.02193	0.02670	0.02114	0.03087	0.05853	0.06570
	Construction	6	0.01931	0.03421	0.02061	0.02016	0.01601	0.01818	0.01350	0.01827	0.02514	0.02166
	Ordnance & Chemical Manufacturing	7	0.00336	0.00568	0.00690	0.00422	0.00246	0.00620	0.00377	0.00668	0.00253	0.00273
	Food and kindred Products	8	0.02031	0.01557	0.02337	0.02085	0.02009	0.02234	0.01834	0.02357	0.02642	0.02739
	Textile Products and Apparel	9	0.00343	0.00260	0.00405	0.00359	0.00341	0.00388	0.00348	0.00443	0.00452	0.00479
	Lumber and Wood Products	10	0.00130	0.00110	0.00219	0.00114	0.00065	0.00041	0.00060	0.00257	0.00047	0.00050
	Paper and Publishing	11	1.05013	0.00490	0.00743	0.00550	0.00536	0.00588	0.00552	0.00675	0.00749	0.00815
	Petroleum Refining and Products	12	0.02210	1.09949	0.03334	0.02379	0.01990	0.02164	0.01909	0.02464	0.08453	0.09709
	Glass, Stone and Clay Products	13	0.00128	0.00334	1.14404	0.00297	0.00136	0.00232	0.00498	0.00368	0.00178	0.00206
	Primary and Fabricated Metals	14	0.00327	0.00737	0.00510	1.10135	0.02184	0.03230	0.01711	0.05890	0.00419	0.00517
	Computer, Office and Service equipment	15	0.00694	0.00495	0.00807	0.00717	1.02455	0.00778	0.00639	0.00825	0.00900	0.00889
	Electrical Equipment	16	0.00356	0.00355	0.00403	0.00683	0.05506	1.09296	0.08519	0.00769	0.00508	0.00591
I	Scientific Instruments	17	0.00138	0.00087	0.00103	0.00198	0.00708	0.00173	1.01386	0.00217	0.00098	0.00118
N	All Other Manufacturing	18	0.00703	0.00578	0.00594	0.00919	0.00925	0.01312	0.01002	1.05596	0.00564	0.02461
D	Transportation and Warehousing	19	0.01754	0.01391	0.08589	0.02000	0.01097	0.01302	0.01228	0.02057	1.17466	0.01402
U	All Other Transportation	20	0.02743	0.06255	0.03659	0.02128	0.02337	0.02197	0.01742	0.02168	0.02910	1.09228
S	Communication	21	0.02477	0.02064	0.03231	0.02584	0.02457	0.02707	0.02339	0.02758	0.03960	0.03808
T	Electric and Gas Utilities	22	0.05085	0.08377	0.09416	0.07731	0.05100	0.06791	0.05070	0.06258	0.06648	0.06431
R	Water and Other Utilities	23	0.00564	0.00739	0.01035	0.00685	0.00582	0.00593	0.00521	0.00963	0.00670	0.00956
Y	Wholesale Trade	24	0.05136	0.07147	0.06334	0.06802	0.09134	0.07222	0.06132	0.08319	0.05550	0.05986
	Retail Trade	25	0.14916	0.10882	0.17681	0.15506	0.14794	0.16459	0.13312	0.17471	0.22568	0.19605
S	Finance, Insurance and Real Estate	26	0.15743	0.13860	0.18587	0.16415	0.15669	0.18148	0.14645	0.18181	0.22683	0.24229
E	Hotel Restaurant and Other Personal Services	27	0.06144	0.04382	0.06748	0.06100	0.06164	0.06724	0.05501	0.07161	0.07818	0.09139
L	Data Processing and Computer Services	28	0.00877	0.00781	0.00972	0.00849	0.00761	0.00902	0.00707	0.00881	0.01120	0.01524
L	Management and Consulting Services	29	0.01210	0.01285	0.01255	0.01098	0.01069	0.01217	0.01124	0.01351	0.01715	0.01691
I	Engineering and Related Services	30	0.00148	0.00191	0.00144	0.00136	0.00120	0.00135	0.00100	0.00135	0.00171	0.00155
N	Other Bussiness Services	31	0.05652	0.03356	0.05643	0.04853	0.04461	0.05202	0.05332	0.06173	0.05363	0.06626
G	Automobile and Other Repair Services	32	0.04721	0.03751	0.05403	0.04876	0.04139	0.04453	0.04290	0.05353	0.09274	0.05994
	Amusements, Recreation and Video Services	33	0.02012	0.01516	0.02371	0.02086	0.01999	0.02277	0.01847	0.02387	0.02687	0.02673
	Health, Education and Social Services	34	0.04613	0.03440	0.05317	0.04730	0.04486	0.05138	0.04252	0.05402	0.05912	0.05851
	Government Services	35	0.01080	0.00808	0.01257	0.01117	0.01067	0.01189	0.00954	0.01254	0.01402	0.01382
	Local Government	36	0.04559	0.04334	0.04202	0.03887	0.03736	0.04124	0.03091	0.04175	0.04218	0.04574
	State Government	37	0.07465	0.12318	0.07614	0.07370	0.05947	0.06836	0.04954	0.06744	0.10399	0.08122
	United States Department of Energy	38	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Households	39	0.67361	0.48360	0.79256	0.70190	0.67319	0.74960	0.60400	0.79286	0.88252	0.87211
	*** Column Sums ***		2.71927	3.18235	3.26635	2.97677	2.74492	2.95417	2.60886	3.05297	3.45972	3.35716

Table 15. Direct, Indirect, and Induced Coefficients, Input-Output Tables, US DOE, State of New Mexico, FY 1995 (continued).

			INDUSTRY PURCHASING									
			21	22	23	24	25	26	27	28	29	30
	Livestock and Livestock Products	1	0.00646	0.00296	0.00433	0.00601	0.00604	0.00609	0.01223	0.00612	0.00752	0.00473
	Other Agricultural Products	2	0.00707	0.00319	0.00473	0.00659	0.00661	0.00662	0.01360	0.00672	0.00786	0.00519
	Forestry and Fishery Products	3	0.00040	0.00024	0.00037	0.00038	0.00037	0.00049	0.00044	0.00037	0.00043	0.00028
	Agricultural, Forestry, and Fishery Services	4	0.00292	0.00111	0.00192	0.00221	0.00208	0.00331	0.00357	0.00197	0.00246	0.00140
	Mining, Crude Petroleum, and Natural Gas	5	0.02372	0.20461	0.04076	0.02700	0.02860	0.02257	0.02666	0.02418	0.03094	0.01595
	Construction	6	0.02700	0.02209	0.02276	0.02581	0.02442	0.03932	0.02459	0.02372	0.02816	0.01818
	Ordnance & Chemical Manufacturing	7	0.00272	0.00212	0.01112	0.00213	0.00209	0.00241	0.00376	0.00222	0.00546	0.00139
	Food and kindred Products	8	0.02701	0.01192	0.01812	0.02567	0.02601	0.02502	0.09241	0.02588	0.03104	0.01960
	Textile Products and Apparel	9	0.00475	0.00200	0.00303	0.00427	0.00426	0.00402	0.00548	0.00433	0.00516	0.00335
	Lumber and Wood Products	10	0.00050	0.00038	0.00781	0.00066	0.00048	0.00054	0.00051	0.00051	0.00060	0.00030
	Paper and Publishing	11	0.00822	0.00389	0.00584	0.01118	0.00773	0.01039	0.00808	0.02079	0.01401	0.00454
	Petroleum Refining and Products	12	0.02482	0.03329	0.04343	0.02950	0.02811	0.02412	0.02418	0.02577	0.03404	0.01717
	Glass, Stone and Clay Products	13	0.00172	0.00165	0.00261	0.00181	0.00160	0.00216	0.00362	0.00161	0.00315	0.00112
	Primary and Fabricated Metals	14	0.00424	0.00413	0.00492	0.00350	0.00350	0.00370	0.00364	0.00434	0.00563	0.00224
	Computer, Office and Service equipment	15	0.00918	0.00393	0.00589	0.00837	0.00851	0.00785	0.00772	0.01106	0.01009	0.00688
	Electrical Equipment	16	0.01946	0.00289	0.00520	0.00464	0.00475	0.00600	0.00437	0.03666	0.03989	0.00280
I	Scientific Instruments	17	0.00147	0.00081	0.01053	0.00102	0.00103	0.00116	0.00103	0.00124	0.00139	0.00073
N	All Other Manufacturing	18	0.00615	0.00317	0.01475	0.00571	0.00542	0.00568	0.00850	0.00883	0.00901	0.00315
D	Transportation and Warehousing	19	0.01126	0.00799	0.01504	0.01144	0.01235	0.02158	0.01681	0.01166	0.01570	0.00647
U	All Other Transportation	20	0.02027	0.03446	0.02119	0.02681	0.01953	0.02305	0.01917	0.02619	0.06428	0.01054
S	Communication	21	1.14487	0.01541	0.02620	0.03707	0.03612	0.04036	0.03100	0.04868	0.04657	0.02048
T	Electric and Gas Utilities	22	0.05781	1.19640	0.09449	0.06243	0.07816	0.05326	0.07821	0.05750	0.06862	0.03770
R	Water and Other Utilities	23	0.01216	0.00489	1.05965	0.00656	0.00747	0.00735	0.00878	0.00623	0.00738	0.00437
Y	Wholesale Trade	24	0.04361	0.02790	0.05648	1.05526	0.03961	0.03827	0.06646	0.05119	0.05660	0.02693
	Retail Trade	25	0.19602	0.08471	0.13284	0.18257	1.18508	0.17119	0.16744	0.19001	0.21463	0.14831
S	Finance, Insurance and Real Estate	26	0.22743	0.10833	0.21681	0.21857	0.25387	1.37222	0.23153	0.23099	0.27817	0.13726
E	Hotel Restaurant and Other Personal Services	27	0.07700	0.03355	0.05720	0.08571	0.08273	0.08097	1.06980	0.07823	0.10409	0.05166
L	Data Processing and Computer Services	28	0.01457	0.00837	0.01178	0.00976	0.01232	0.02282	0.00970	1.06603	0.03605	0.00640
L	Management and Consulting Services	29	0.01641	0.00731	0.01438	0.01726	0.01773	0.02656	0.01954	0.01832	1.07723	0.00689
I	Engineering and Related Services	30	0.00206	0.00154	0.00175	0.00181	0.00185	0.00270	0.00189	0.00180	0.00214	1.00139
N	Other Bussiness Services	31	0.05598	0.02349	0.04385	0.07387	0.09961	0.07612	0.06764	0.05933	0.09769	0.02574
G	Automobile and Other Repair Services	32	0.05977	0.02918	0.04981	0.07427	0.06801	0.05644	0.05703	0.06769	0.08114	0.03486
	Amusements, Recreation and Video Services	33	0.13296	0.01172	0.01799	0.02733	0.02564	0.02475	0.02615	0.02729	0.03036	0.01947
	Health, Education and Social Services	34	0.06095	0.02708	0.04004	0.05613	0.05656	0.05455	0.05284	0.05941	0.07113	0.04466
	Government Services	35	0.01430	0.00634	0.00942	0.01311	0.01333	0.01262	0.01222	0.01376	0.01547	0.01081
	Local Government	36	0.06165	0.04295	0.05153	0.04473	0.05503	0.05426	0.05626	0.05441	0.06415	0.04308
	State Government	37	0.10699	0.08507	0.09244	0.11016	0.09609	0.18635	0.09808	0.09203	0.11048	0.06962
	United States Department of Energy	38	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	Households	39	0.88930	0.37694	0.57437	0.81969	0.83081	0.76513	0.75589	0.86059	0.96464	0.67679
	*** Column Sums ***		3.38319	2.43800	2.79540	3.10100	3.15350	3.26201	3.09083	3.22768	3.64334	2.49245

Table 15. Direct, Indirect, and Induced Coefficients, Input-Output Tables, US DOE, State of New Mexico, FY 1995 (continued).

			INDUSTRY PURCHASING								
			31	32	33	34	35	36	37	38	39	*Row Sums*
	Livestock and Livestock Products	1	0.00536	0.00420	0.00695	0.00836	0.00422	0.00969	0.01178	0.00614	0.01036	1.71320
	Other Agricultural Products	2	0.00587	0.00460	0.00747	0.00912	0.00467	0.01015	0.01199	0.00676	0.01148	1.77416
	Forestry and Fishery Products	3	0.00033	0.00028	0.00043	0.00048	0.00020	0.00113	0.00186	0.00034	0.00050	1.04415
	Agricultural, Forestry, and Fishery Services	4	0.00182	0.00177	0.01128	0.00361	0.00118	0.00369	0.00484	0.00200	0.00290	1.52130
	Mining, Crude Petroleum, and Natural Gas	5	0.02066	0.02336	0.02672	0.03276	0.01425	0.03871	0.03512	0.02522	0.03500	3.16287
	Construction	6	0.02174	0.02021	0.02912	0.02952	0.00958	0.11193	0.19003	0.04049	0.02352	2.16352
	Ordnance & Chemical Manufacturing	7	0.00191	0.00568	0.00419	0.00884	0.00115	0.00543	0.00436	0.00221	0.00282	1.54127
	Food and kindred Products	8	0.02292	0.01787	0.02928	0.03919	0.01787	0.03693	0.04018	0.02584	0.04388	2.07579
	Textile Products and Apparel	9	0.00386	0.00348	0.00527	0.00629	0.00309	0.00596	0.00616	0.00442	0.00759	1.22267
	Lumber and Wood Products	10	0.00044	0.00038	0.00069	0.00151	0.00021	0.00125	0.00184	0.00068	0.00052	1.16423
	Paper and Publishing	11	0.00990	0.00561	0.00968	0.02344	0.00359	0.02681	0.01278	0.00712	0.00882	1.36668
	Petroleum Refining and Products	12	0.02206	0.02588	0.02481	0.03314	0.01542	0.04015	0.03648	0.02392	0.03787	2.22920
	Glass, Stone and Clay Products	13	0.00145	0.00268	0.00178	0.00290	0.00077	0.00520	0.00770	0.00190	0.00188	1.25938
	Primary and Fabricated Metals	14	0.00333	0.00733	0.00399	0.00451	0.00146	0.02323	0.00854	0.00639	0.00358	1.42811
	Computer, Office and Service equipment	15	0.00763	0.00598	0.00830	0.01081	0.00646	0.01086	0.00992	0.01237	0.01587	1.31624
	Electrical Equipment	16	0.00849	0.01411	0.00542	0.00680	0.00221	0.01472	0.00925	0.00918	0.00543	1.52186
I	Scientific Instruments	17	0.00126	0.00097	0.00134	0.00636	0.00052	0.00733	0.00187	0.00181	0.00127	1.08853
N	All Other Manufacturing	18	0.00526	0.00923	0.00764	0.01215	0.00260	0.01397	0.00883	0.00602	0.00640	1.38387
D	Transportation and Warehousing	19	0.00993	0.01184	0.01268	0.01618	0.00560	0.02410	0.01390	0.00943	0.01375	1.85638
U	All Other Transportation	20	0.01949	0.01625	0.02098	0.02718	0.00876	0.03302	0.03763	0.01796	0.02151	2.05313
S	Communication	21	0.03596	0.02763	0.03586	0.04224	0.01764	0.06558	0.05363	0.03397	0.04332	2.29887
T	Electric and Gas Utilities	22	0.04920	0.04843	0.07674	0.08318	0.03391	0.08302	0.08228	0.06561	0.08329	3.60488
R	Water and Other Utilities	23	0.00573	0.00481	0.00846	0.00891	0.00376	0.01115	0.01357	0.00624	0.00923	1.33370
Y	Wholesale Trade	24	0.03696	0.05125	0.04344	0.06274	0.02431	0.05661	0.05806	0.06504	0.05970	3.26260
	Retail Trade	25	0.16309	0.14201	0.18049	0.23364	0.13868	0.23456	0.23183	0.22976	0.34059	7.44507
S	Finance, Insurance and Real Estate	26	0.20549	0.18127	0.25933	0.30996	0.12368	0.29986	0.29516	0.19080	0.30374	8.83021
E	Hotel Restaurant and Other Personal Services	27	0.07588	0.06116	0.07851	0.09730	0.04741	0.10680	0.08970	0.07118	0.11643	3.62716
L	Data Processing and Computer Services	28	0.01905	0.00755	0.01431	0.01755	0.00528	0.02806	0.01832	0.02351	0.01298	1.51188
L	Management and Consulting Services	29	0.02867	0.01532	0.02296	0.02420	0.00543	0.03386	0.02476	0.04105	0.01333	1.66394
I	Engineering and Related Services	30	0.00166	0.00158	0.00218	0.00221	0.00062	0.01841	0.01099	0.02851	0.00153	1.11557
N	Other Bussiness Services	31	1.07941	0.05020	0.09614	0.07511	0.02270	0.06893	0.06109	0.08241	0.05575	3.19233
G	Automobile and Other Repair Services	32	0.05696	1.05813	0.06893	0.07334	0.03187	0.07086	0.06522	0.05115	0.07826	3.09349
	Amusements, Recreation and Video Services	33	0.02341	0.01815	1.13887	0.03499	0.01784	0.04086	0.03420	0.02629	0.04382	2.13747
	Health, Education and Social Services	34	0.05357	0.04081	0.05950	1.08076	0.04102	0.08599	0.08085	0.07253	0.10075	3.02336
	Government Services	35	0.01184	0.00912	0.01318	0.01692	1.00988	0.02469	0.01849	0.01764	0.02426	1.47194
	Local Government	36	0.05011	0.04748	0.06025	0.06500	0.01814	1.04197	0.04072	0.04356	0.04454	2.70874
	State Government	37	0.08536	0.08113	0.12158	0.11598	0.03300	0.08191	1.07955	0.07685	0.08104	4.47639
	United States Department of Energy	38	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	1.00000
	Households	39	0.73726	0.55927	0.81255	1.05908	0.63752	0.99682	0.97185	0.88625	1.56568	28.49519
	*** Column Sums ***		2.89335	2.58703	3.31131	3.68627	2.31649	3.77421	3.68534	3.22256	3.23314	

The results of the tax study are incorporated into the "Production Function" of each of the economic model sectors defined in this report. These results show the incidence of state and local government taxes on businesses varies from a low of 0.8 percent (milling, planning, and structural wood products, and motor freight transportation and warehousing) to a high of about 11 percent (petroleum refining and products) of a business's dollar volume activity. The DOE and its direct contractors pay 2.4 percent of the cost of services rendered in-state and local government taxes. Individuals pay an average of 1.7 percent of each dollar earned (income tax, property tax, etc.)

Including the payment of state and local government taxes by businesses and individuals into the economic impact model results in a higher percentage of activity being captured by the model. Thus the multiplier effects with taxes included are greater but more representative of the actual impact of the DOE on New Mexico.

MULTIPLIERS

The Type I multiplier takes into account only direct and indirect changes resulting from an increase of $1 in the output of an industry. In this case, households (the induced effect) are excluded from the impact calculation. The Type II activity multiplier is a more realistic measure because it takes into account direct and indirect effects plus induced effects resulting from including households.

These additional induced effects include household income generation through payments for labor services as well as the associated consumer spending.

One of the major uses of input-output information is to assess the effect on an economy of developments initiated from outside the economy (exogenous changes on New Mexico). The most important items derived from an input-output model are the multipliers. Three of the most frequently used types of multipliers estimate the effects of the exogenously induced changes on (1) outputs of sectors in the economy, (2) income earned by households, and (3) employment, in physical terms, that is expected to be generated due to changes in output. The notion of multipliers rests upon the difference between the initial effect of an exogenous change in demand and the total effects of that change.

The Type II economic activity (output) multiplier measures the volume of activity generated among various sectors of a region due to a $1 exogenous change in a sector. For example, the economic activity multiplier for DOE in 1995 is 3.25 (Table 16). This number is close to the column sum (3.52) of sector 38-DOE, in the direct, indirect, and induced coefficient matrix. The column sum differs only by the adjustment for fringe benefit losses to out-of-state entities and the addition of interests, rents, and dividends not directly calculated by the matrix portion of the model.

Table 16. Type II Multipliers for DOE/New Mexico, FY 1994 and FY 1995.

Year	Economic Activity	Income	Employment
FY 1994	3.45	2.51	3.83
FY 1995	3.25	2.34	3.57

A multiplier of 3.25 for FY 1995 indicates that for every $1 spent by DOE on materials, labor, benefits, equipment, services, etc., another $2.25 is generated in the state for a total impact of $3.25.

Income multipliers measure the indirect and induced effects associated with new income generated from payments to labor at DOE offices and GOCO facilities. In the model, these Type II multipliers are derived by dividing the net direct, indirect, and induced income impacts generated by the model, and by direct net salaries and wages (mainly, net income not including transfer payments). The income multiplier for FY 1995 was estimated to be 2.34 compared to 2.51 for FY 1994. A multiplier of 2.34 for FY 1995 indicates that for every $1 of income generated by DOE/NM for labor and another $1.34 is generated in the state for a total impact of $2.34

Employment multipliers measure the number of indirect and induced jobs supported, on average, relative to one employee of DOE/New Mexico. In the model, these Type II multipliers are derived by dividing the total employment impact generated by the model by direct employment figures. For DOE, the employment multiplier is 3.57 in 1995 (Table 16). This multiplier indicates that for every

100 jobs that are created by DOE, another 257 jobs are supported in the state.

Tables 17 gives the DOE indirect employment impact, using Type II multipliers for FY 1995, by sector. The labor-intensive sectors obviously have a greater indirect employment impact. The "retail trade" sector has the largest indirect employment impact at 27 percent of the total. Other sectors with large indirect employment impact include lodging and personal services (10 percent), FIRE (10 percent), local and state government (9 percent), health, education and social services (8 percent), wholesale trade (5 percent), other business services (5 percent), and construction (3 percent).

The income multiplier is lower than the employment multiplier for both FY 1994 and FY 1995 because many of the jobs created directly by DOE pay above-average wages compared to sectors where DOE's indirect impact is large in terms of employment—such as retail and service sectors. However, such sectors tend to generate a great deal of economic activity throughout the state.

Table 17. Indirect Volume and Employment Impacts by Sub-sector, US DOE, State of New Mexico, FY 1995.

Sector	Volume ($000)	Employment Jobs	Employment %
1. Livestock and Livestock Products	18261.	52.6	0.1
2. Other Agricultural Products	20083.	121.2	0.2
3. Forestry and Fishery Products	1024.	4.0	0.0
4. Agricultural, Forestry, and Fishery Services	5940.	199.6	0.4
5. Mining, Crude Petroleum, and Natural Gas	74975.	298.7	0.5
6. Construction	120370.	1416.3	2.6
7. Ordnance & Chemical Manufacturing	6577.	50.5	0.1
8. Food and kindred Products	76817.	434.6	0.8
9. Textile Products and Apparel	13149.	164.0	0.3
10. Lumber and Wood Products	2014.	24.3	0.0
11. Paper and Publishing	21162.	301.8	0.6
12. Petroleum Refining and Products	71109.	54.4	0.1
13. Glass, Stone and Clay Products	5663.	66.4	0.1
14. Primary and Fabricated Metals	19011.	175.9	0.3
15. Computer, Office and Service equipment	36769.	314.4	0.6
16. Electrical Equipment	27296.	233.4	0.4
17. Scientific Instruments	5395.	41.1	0.1
18. All Other Manufacturing	17883.	193.8	0.4
19. Transportation and Warehousing	28030.	351.1	0.6
20. All Other Transportation	53399.	817.8	1.5
21. Communication	100997.	1003.6	1.8
22. Electric and Gas Utilities	195035.	391.5	0.7
23. Water and Other Utilities	18557.	244.7	0.4
24. Wholesale Trade	193352.	2572.6	4.7
25. Retail Trade	683024.	14753.1	26.9
26. Finance, Insurance and Real Estate	567201.	5353.9	9.8
27. Hotel Restaurant and Other Personal Services	211607.	5649.0	10.3
28. Data Processing and Computer Services	69878.	863.3	1.6
29. Management and Consulting Services	122026.	1112.4	2.0
30. Engineering and Related Services	84746.	811.8	1.5
31. Other Bussiness Services	244990.	2733.0	5.0
32. Automobile and Other Repair Services	152050.	1613.4	2.9
33. Amusements, Recreation and Video Services	78153.	1948.0	3.6
34. Health, Education and Social Services	215608.	4513.0	8.2
TOTAL Private Sector	3562152.	48879.0	89.3
35. Government Services	52442.	723.6	1.3
36. Local Government	129507.	1930.0	3.5
37. State Government	228463.	3221.0	5.9
TOTAL Public Sector	410412.	5874.6	10.7
TOTAL Private and Public Sectors	3972564.	54753.6	100.0

** detail may not add due to rounding

Table 18. Indirect Volume and Employment Impacts by Sub-sector, US DOE, State of New Mexico, FY 1995.

Sector	Volume ($000)	Employment Jobs
1. Agriculture	45309.	377.4
2. Mining	74975.	298.7
3. Construction	120370.	1416.3
4. Manufacturing	302846.	2054.5
5. Transportation, Communication, Utilities	396017.	2808.6
6. Wholesale and Retail Trade	876375.	17325.7
7. Finance, Insurance, and Real Estate	567201.	5353.9
8. Other Services and Education	1179058.	19243.9
9. Local, State, and Other Government Services	410412.	5874.6
TOTAL	3972564.	54753.7
10. US Department of Energy	0.	0.0
11. Households	0.	0.0

** detail may not add due to rounding

Table 19. Income and Jobs Impact, US DOE, State of New Mexico, FY 1995.

	Income ($000)	Jobs
Direct Salaries and Wages	1168714.	21307.
Indirect Salaries and Wages	1044016.	48879.
Interests, Dividends, and Rents	362060.	n/a
Total Private Sector	2574789.	70186.
Total Public Sector	154911.	5875.
Transfer Payments --	(0.)	n/a
Net Impact	2729700.	76061.

Table 20. Type II Multipliers, US DOE, State of New Mexico, FY 1995.

	Economic Activity ($000)	Income ($000)	Jobs
Direct impacts	2972776.	1168713.	21307.
Indirect and induced impacts	6702264.	1560986.	54754.
Total impacts	9675039.	2729700.	76061.
Type II Multipliers	3.25	2.34	3.57