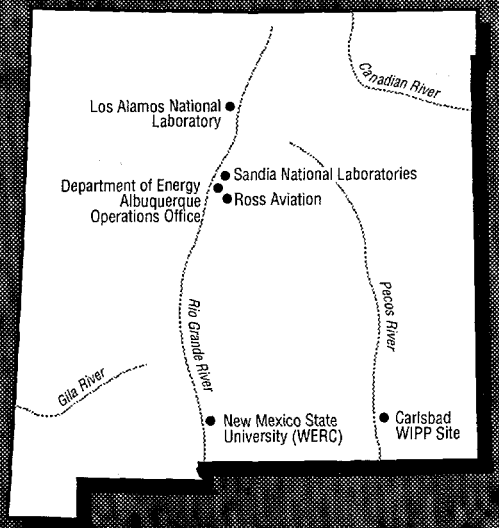
THE ECONOMIC IMPACT OF THE DEPARTMENT OF ENERGY ON THE STATE OF NEW MEXICO

FISCAL YEAR 1997



Office of:
Technology and Site Programs
Albuquerque Operations Office
U.S. Department of Energy

In cooperation with:
Agricultural Experiment Station
College of Agriculture and Home Economics
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The Economic Impact of the Department of Energy on the State of New Mexico Fiscal Year 1997

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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 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 1997. 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 (NMDOL). Steve Pazand, Unit Supervisor, Actuarial Research, NMDOL made certain we obtained the detailed, but unpublished data needed for our research. Larry Blackwell, Chief, Economic Research and Analysis Bureau, 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.

Luella Aragon, 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 Anthony Mancino, 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. Richard Shepardson and Pam Spicer from SNL and Allan Johnston and Tom Short from LANL supplied expenditure data. Data was also supplied by various individuals from the Waste Isolation Pilot Plant, Uranium Mill Tailings Remedial Action Project, National Atomic Museum, Ross Aviation, and the Central Training Academy.

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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 more than 50 years. DOE facility locations in New Mexico are shown in Figure 1.

DOE provided funding of just over $2.9 billion in Fiscal Year (FY) 1997 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 1996 (October 1, 1995, through September 30, 1996) and FY 1997 (October 1, 1996, through September 30, 1997). 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 just over $2.9 billion in New Mexico for FY 1997 was slightly under $10.23 billion. The total personal income impact was about $2.9 billion. The DOE employment for FY 1997 was 19,977 and the indirect and induced effect was 53,085 jobs for a total impact of 73,062 jobs.

Table 1. DOE/New Mexico's Influence on New Mexico's Economy, FY 1997.

Economic Measure	Revised FY 1996 DOE/NM	FY 1997 DOE/New Mexico	FY 1997 Total State	FY 1997 DOE as % of State
	---- billions of dollars- ----			
Economic Activity				
Direct Expenditures	2.86	2.94		
Indirect and Induced (a)	6.95	7.29		
Total Economic Activity	9.81	10.23	91.2	11.2
Economic Activity Multiplier	3.43	3.48		
Personal Income				
Gross Labor Costs	1.25	1.30		
Net Wages and Salaries	1.15	1.19		
Indirect and Induced (a)	1.63	1.71		
Total Personal Income	2.77	2.90	33.9(b)	8.6
Personal Income Multiplier	2.42	2.43		
Employment				
Direct	19,881	19,977		
Indirect and Induced (a)	52,251	53,085		
Total Employment	72,132	73,062	820,469(c)	8.9
Employment Multiplier	3.63	3.66		

a. FY 1996 results based on FY 1997 econometric model.
b. BEA April 1997 Preliminary.
c. New Mexico Department of Labor, Table C, March, 1998.

As Table 2 indicates, from the FY 1997 funding of $2.9 billion, DOE/New Mexico instate organizations and activities spent about $2.1 billion in FY 1997 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 about $806 million. The employment figure of 19,977 includes major on-site subcontractor data for both Los Alamos (LANL) and Sandia National Laboratories (SNL).

In FY 1996, the total impact of DOE on the state was less than in 1997. Also, in 1996 the economic activity resulting from the initial infusion of nearly $2.9 billion in New Mexico was $9.8 billion (Table 1). The total personal income impact was just under $2.8 billion. The DOE employment for FY 1996

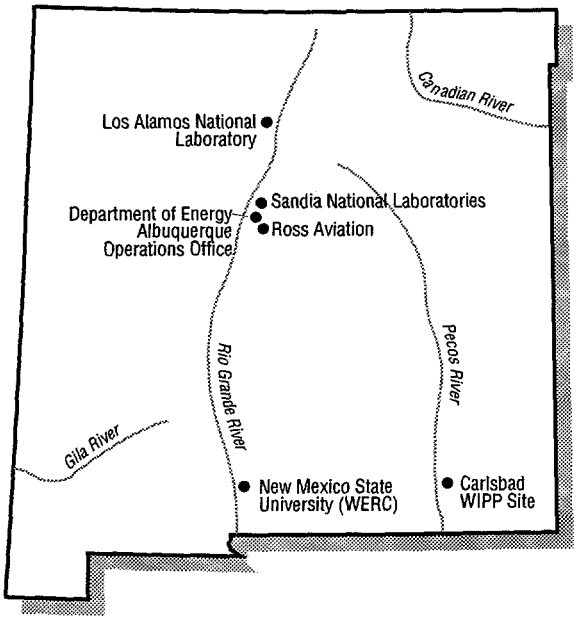


Figure 1. DOE Facilities in New Mexico.

Table 2. DOE/New Mexico Funding, Instate Expenditures and Employment by Major Entity in New Mexico, FY 1996 and FY 1997.

Entity	FY 1996 New Mexico Funding	FY 1996 Instate Expenditures	FY 1996 New Mexico Employment	FY 1997 New Mexico Funding	FY 1997 Instate Expenditures	FY 1997 New Mexico Employment
	--millions of dollars--		(jobs)	--millions of dollars--		(jobs)
Martin Marietta (SNL)	1,426.5	919.7	7,684	1,375.0	886.8	7,468
Univ. of California (LANL)	1,008.0	776.9	8,198	1,143.0	863.6	8,461
US DOE Albuquerque Operations Office	130.1	130.1	1,063	138.2	138.2	1,016
Westinghouse Electric Corp (WIPP)	83.6	65.7	626	89.7	75.8	635
Johnson Controls (LANL)	81.3	67.9	1,136	76.9	70.5	1,435
Allied Signal	24.9	21.9	290	30.8	22.5	287
PT-LA	22.9	22.9	385	29.4	26.1	392
Other US DOE Operations Offices	22.5	22.5	13	13.9	13.9	16
Lovelace Medical Foundation (ITRI) (a)	16.6	13.2	188	0.0	0.0	0
Jacob's Engineering Group Inc. (UMTRA)	14.6	7.6	48	4.8	3.3	49
Ross Aviation Inc.	13.4	6.7	100	11.4	6.2	78
US DOE Nevada Operations Office	9.9	8.5	83	8.7	8.7	72
M-K Ferguson Company Inc. (UMTRA)	4.3	4.3	56	3.7	3.7	49
US DOE Idaho Operations Office	3.1	3.1	2	3.0	3.0	1
US DOE Oak Ridge Operations Office	1.7	1.7	9	3.2	3.2	9
Other Contractors New Mexico	0.9	0.9		6.6	6.6	9
Total	2,864.3	2,073.6	19,881	2,938.2	2,132.0	19,977

a. Lovelace was privatized in FY 1996, therefore is not part of the direct impacts of DOE NM on the state in FY 1997 and thereafter.

was 19,881 and the indirect and induced effect was 52,251 jobs, for a total impact of 72,132 jobs in FY 1996.

Over the past few years, DOE/New Mexico expenditures increased each year from FY 1984 through FY 1990. Expenditures then decreased slightly in FY 1991, rose again from FY 1992 through FY 1994 and then decreased slightly in FY 1995 and remained at about $2.1 billion through FY 1997 (Figure 2). This upward trend 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.

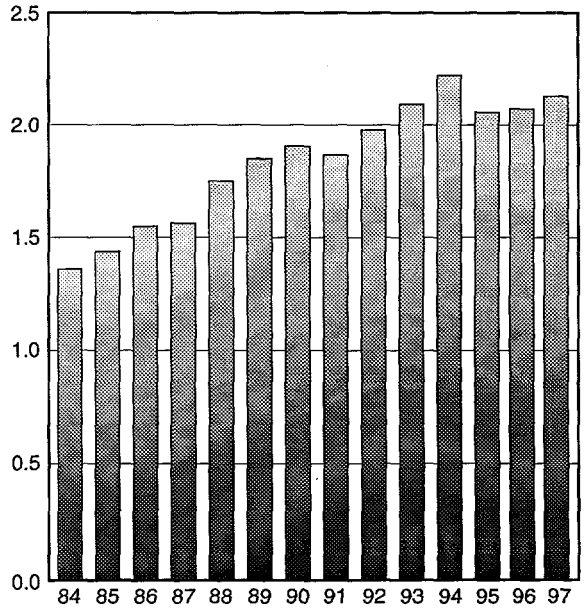
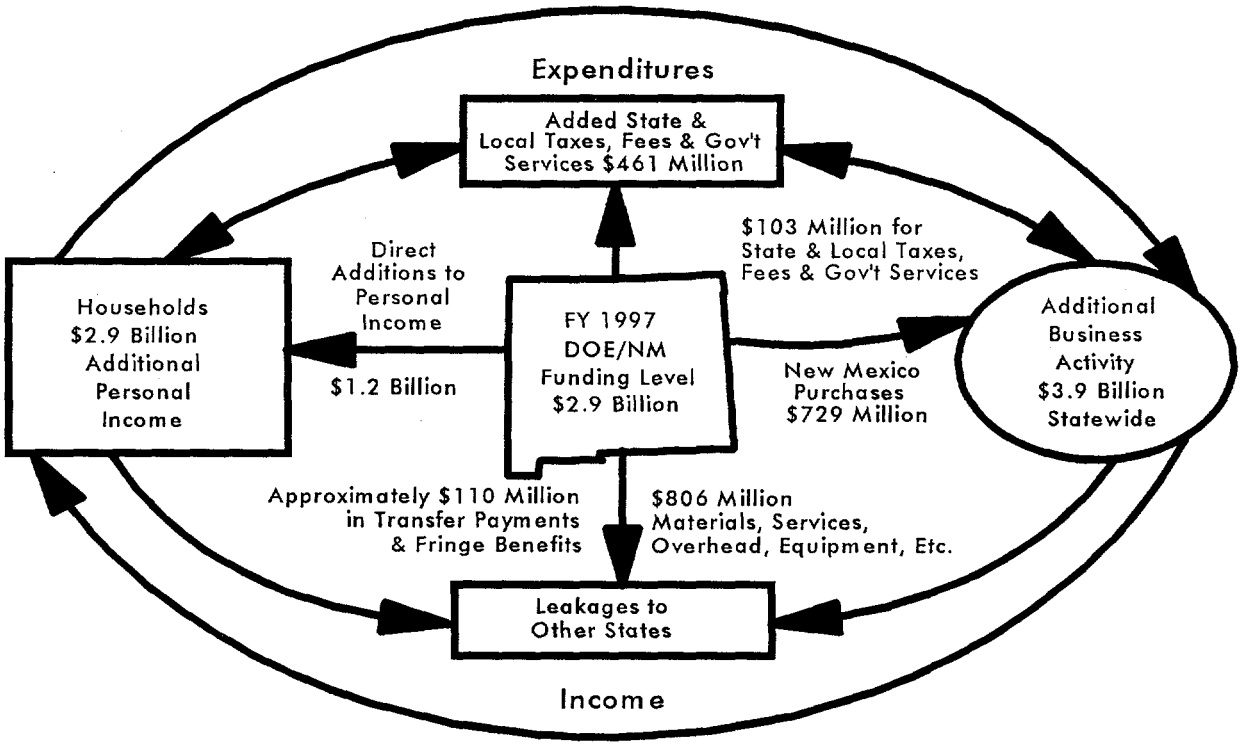


Figure 2. DOE Expenditures in New Mexico, FY 1984-1997.

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 or declining slightly; and 2) the overall state economy is continuing to grow making DOE's contribution a lesser part.

The economic data support the following conclusions:

- DOE/New Mexico funding accounts for approximately one-fourth, of all federal expenditures in New Mexico.
- The total economic impact of DOE's New Mexico funding of $2.9 billion was $10.2 billion in FY 1997. This is over 11 percent of the state's economic activity or more than one of every ten dollars of economic activity statewide. The FY 1996 impact was $9.8 billion, based on slightly less than $2.9 billion in operating and capital budgets for DOE's operations in New Mexico. The FY 1996 impact was about 11 percent of the total economic activity in the state.
- FY 1997, about 73 percent ($2.1 billion) of the total DOE/New Mexico budget of over $2.9 billion was spent in New Mexico for goods, services, and salaries.
- In FY 1997, expenditures in New Mexico had a 3.48 multiplier effect on the statewide economy. For every $100 expended by DOE, another $248 of additional economic activity was generated.
- DOE/New Mexico funding of $2.9 billion is equivalent to nearly $1,700 for each resident. The direct spending in New Mexico of $2.1 billion is equivalent to over $1,200 for each resident.
- DOE operations statewide directly added just under $1.2 billion to total personal income in 1997 (Figure 3). The income multiplier effect generated over $1.7 billion additional personal income for a total impact of over $2.9 billion, or nearly 9 percent of the estimated $33.9 billion from all sources statewide. In short, about one of every $12 in personal income generated in the state is directly or indirectly attributable to DOE activities.
- Total DOE/New Mexico direct employment in 1997 was 19,977 jobs, resulting in a statewide impact of just over 73,000 jobs. Due to the multiplier effect of 3.66, another 266 additional jobs were supported for each 100 direct DOE/NM jobs. Total jobs supported are about



Total Statewide Economic Impact - $10.2 Billion

Figure 3. DOE Economic Impact on New Mexico, FY 1997.

9 percent of all employment or one of every 11 jobs in the state. In FY 1996, the statewide impact on employment was about 72,100 jobs using an employment multiplier of 3.63.

- DOE facility and project contractors paid nearly $103 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 $461 million in revenues from government taxes, fees, and enterprise charges (Figure 3).
- DOE offices and contractors spent about $729 million for goods and services (including construction) in New Mexico for FY 1997. These expenditures generated business activity of about $3.9 billion (Figure 3).

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 50 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) 1996 (October 1, 1995, through September 30, 1996) and FY 1997 (October 1, 1996, through September 30, 1997). 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.

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 1997 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 over 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, 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 1,386 in FY 1997, 1,016 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, two production plants, a training academy, and a test site, Tonopah

Test Range (TTR). TTR is located in Nevada and operated through Sandia National Laboratories.

AL's integrated management and operating (M&O) contractors include the University of California (LANL), Lockheed Martin (SNL), 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); 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 the war-time Project Y of the Manhattan Engineering District with responsibility for developing the first nuclear weapon. It became a multi-discipline, multiprogram Laboratory applying capabilities developed from its original mission to national security and civilian needs during the cold-war era.

Background

The Laboratory is located in Los Alamos County, New Mexico. The county covers 110 square miles and had a 1997 population of 18,275 (Bureau of the Census, 1997). 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.

During 1997, the Laboratory had approximately 8,500 University of California employees, by headcount, (including full-time, part-time, paid and unpaid affiliate, visiting, and casual status) and an additional 1,800 contract employees, vendors, members of the protective guard force, and contractor personnel.

The 1997 operating budget was approximately $1.2 billion. Principal activities are as follows: Defense Programs 53%, Nonproliferation and National Security 9%, Environmental Restoration and Waste Management 12%, Energy Research 6%, Nuclear Energy 2%, Energy Efficiency and Renewable Energy 1%, other DOE 1%, Work for Others 16%.

Administrative, research, and maintenance facilities occupy more than 5.1 million occupiable square feet (of over 8 million gross square feet) of building space, of which 2.3% is leased (off site). The 34 technical areas are scattered over about 43 square miles (27,800 acres). They occupy about 39% of the total county area.

Because of topographic, environmental, operational, and buffering constraints, only about 30% of the 27,800 acres of DOE land is developable. The facilities, including buildings, infrastructure, and capital equipment, have an estimated replacement cost of $4.2 billion.

Los Alamos is involved in partnerships and collaborations with other federal agencies, with industry, and with over 230 universities worldwide. In addition, the Laboratory is committed to helping diversify the regional economy and enhance educational opportunities.

Mission and Capabilities

The Laboratory's central mission is reducing the global nuclear danger, involving work in nuclear weapons and threat reduction. Stockpile stewardship is a major focus for Los Alamos in reducing the global nuclear danger. In an era when the size of the nuclear stockpile is being reduced and there is no longer an option of nuclear testing to certify the reliability and safety of the existing stockpile, computer modeling and simulation through the Accelerated Strategic Computing Initiative (ASCI) plays an increasingly important role in stockpile stewardship.

Los Alamos also applies its expertise to key conventional defense and civilian issues that are synergistic with the central mission and capabilities. For example, the high-performance computing capability and related competencies, as well as addressing national security area such as chemo-biological warfare and stockpile management, address national problems as wide ranging as epidemics, global warming, traffic patterns, and forest fires.

The Laboratory's strength derives from its ability to solve extremely complex problems that require the integration of scientific and technical expertise—an array of disciplines and diverse capabilities—with highly specialized facilities and unique operations expertise.

Los Alamos provides technical assistance to the weapons complex and supports 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 technical capabilities are clustered into eight core technical competencies. These are characterized by those that emphasize a scientific approach and those that emphasize scientific foundations:

Scientific Approach

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

Scientific Foundations

- Nuclear weapons science and technology
- Nuclear and advanced materials
- Earth and environmental systems
- 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, particle beam technology, nuclear weapons science, bioscience, and chemistry.
- *Chemistry and 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 modification 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 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), and
- 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, 1995 Nobel Prize in physics), 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).

- Recently:

  Detection of single fluorescent molecules, first flow cytometer for sorting single biological cells, discovery of the human telomere, complete sequencing of chromosome 16, measurement of neutrino mass, computer modeling of global ocean temperatures. detection of ionic pulsed-pairs of radio impulses by an instrument aboard a satellite, new milestones in high temperature superconductivity and materials processing, and characterization of the earth's changing magnetic field and the spin-rate of the earth's core.

Future Prospects

Los Alamos will continue its role in science-based stockpile stewardship. There may be an increase in the role in non-proliferation and counterproliferation. The Laboratory has been designated as the preferred location to manufacture nuclear weapon pits on a small scale. DOE has assigned the responsibility to develop technology for accelerator-production of tritium to Los Alamos. High performance computing, with its associated capabilities is expected to address additional complex civilian problems.

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 United States 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 facilitates 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 7,500 people are employed by Sandia, and annual operating funding is about $1.4 billion.

Missions and Capabilities

Sandia has responsibility 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, environmental restoration and waste management related to the nuclear weapons complex, 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. About 25 percent of the laboratory's work is for other government agencies, particularly the Department of Defense, in programs where Sandia's unique competencies, built from mission responsibilities, can add value.

Recent Achievements

- Replaced the aging B53 bomb with a modification of the safer B61 bomb
- Developed a higher-security cryptographic controller for programming bomb use-authorization devices
- Produced world-record x-ray pulses with the z-pinch technique in a particle beam accelerator for applications in weapons physics and inertial confinement fusion
- Developed and tested radiation-hardened integrated circuits that can survive five megarads
- Continued to develop record-breaking software applications on the world's first teraflop computer
- Provided assistance to Russian and Ukraine to protect nuclear materials at 44 sites
- Developed and demonstrated an all-weather, day/night guidance system for penetrator weapons
- Supported the process that resulted in approval of the operating application for the Waste Isolation Pilot Plant in Carlsbad, NM, by the Environmental Protection Agency

Future Prospects

Funding for defense programs has stabilized as the laboratory focuses on stockpile stewardship and management in the absence of new weapon development programs. Programs in nonproliferation, arms control, and global nuclear materials management are of growing importance. Energy programs are merging with the broader mission for the security of critical infrastructures. Environmental cleanup activities will continue until 2000 with modest 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 WIPP Land Withdrawal Act of 1992 identified the regulatory and institutional prerequisites for reaching a disposal decision. This act was amended in September 1996 to recognize changes in test strategy, delete duplicative requirements, and establish congressional consensus that WIPP should open by November 1997. These changes were incorporated in an update Final Safety Analysis Report, January 1998. 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 with fewer than 30 people living 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 1997, 1,057 WIPP-related jobs [including CAO, Westinghouse, SNL, the CAO Technical Assistance Contractor (CTAC) and other contractors] were supported by the CAO. The total CAO budget for FY 1997 was approximately $90 million in New Mexico.

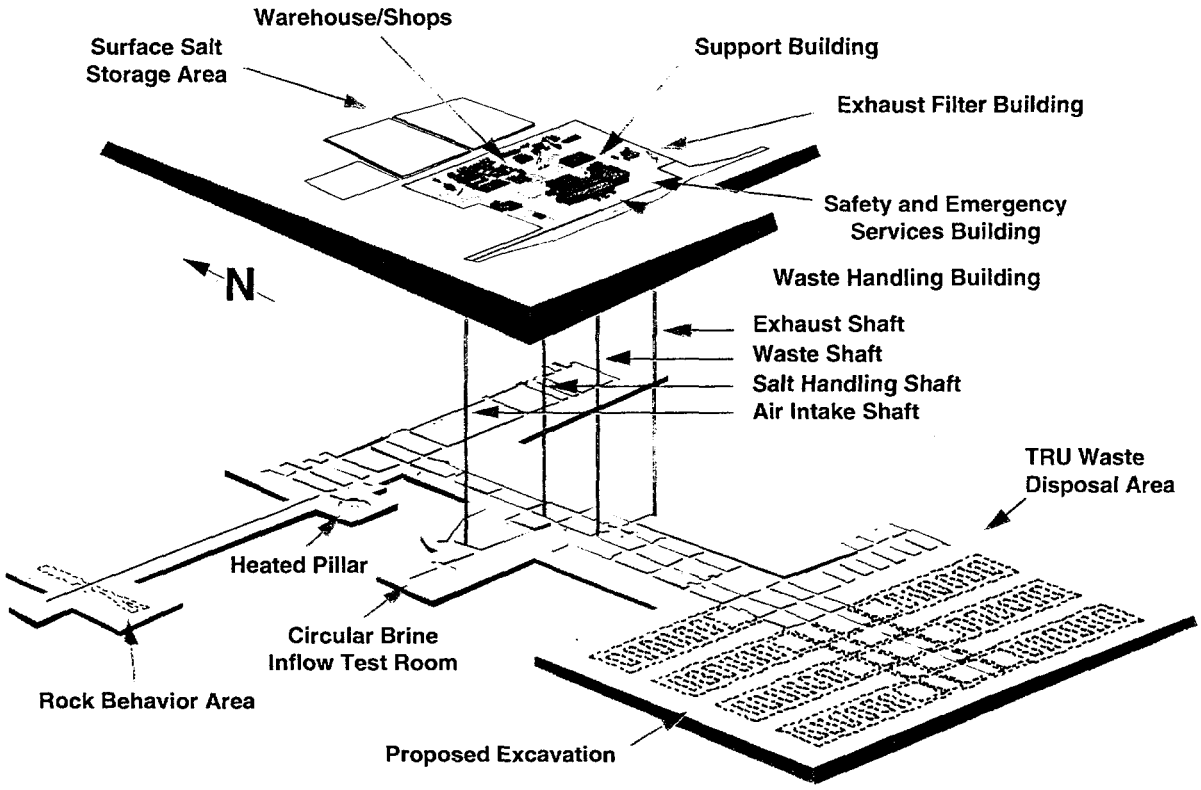


Figure 4. Waste Isolation Pilot Plant Layout.

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 is a critical component for TRU waste disposal within the DOE vision to clean up the DOE Weapons Complex by the year 2006.

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 FY 1997, the CAO and its contractors achieved the following:

Advanced Manufacturing and Innovation Training Center (AM&ITC)

- Provided financial and human resource support for the continued development of the AM&ITC, a center offering training, education, and business incubation and expansion opportunities in Southeastern New Mexico. Start-up support in FY 1996 included $1.96 million from the CAO, as well as CAO and contractor oversight of operations. Continued support for expanded regional services in FY 1997 included AM&ITC training and education for displaced workers in the mining industry. An AM&ITC open house was conducted in February 1998 to demonstrate new equipment purchased, including computer-assisted drafting, computer-assisted manufacturing and

computer numeric control facilities, pneumatics, hydraulics, and control trainers. The AM&ITC operates a state-of-the-art machine shop program. During FY 1996-97, credit and custom courses totaled 39, with 698 students trained. Twelve courses were scheduled for the fall 1998 semester. Space has been leased at the AM&ITC to New Mexico State University - Carlsbad, Sandia National Laboratories, Westinghouse, Nuclear Filter Technologies, and Mobile Characterization Services.

Southeast New Mexico National Environmental Technology and Training Center (TTC)

- Provided a total of $1.5 million financial support to the TTC during the three-year period FY 1996-98. The TTC now operates self-sufficiently. The center supports National Transuranic Waste (TRU) Program training needs as well as regional environment, safety and health training. During FY 1996-97, the TTC conducted a total of 230 courses, training approximately 4,000 students. Clients have included Battelle, LLNL, SNL, EPA and a variety of Carlsbad area businesses.
- Additional CAO support for the TTC during FY 1997 included initial construction of the Energy Training Internet Hub (En-Train) World Wide Web site, enabling personnel across the DOE complex to take training on-line. Free, public access is provided to extensive training and technical materials created at DOE locations, offering proven, best-of-class training, one-stop access to free materials, immediate download and a variety of training formats. The En-Train operation is scheduled to be transferred to the TTC by the end of FY 1998.

Technology Transfer

- Since inception of the CAO Technology Transfer Program in 1995, the investment of $50,000 per year has resulted in more than 5,000 transfers of CAO-developed soft technology, such as training materials, technical documents, surveys, and assessment instruments to U.S. organizations. Recipients include educational institutions, governmental agencies, non-profit groups, and businesses. More than 350 transfers were completed to women-owned small businesses during the period. Annual surveys of transfer recipients demonstrated $21.4 million in private sector economic impact and 500 jobs created or retained. More than 90 percent of transfers are conducted electronically via e-mail and the Internet, with one-day cycle time. Clients have included Harvard and Yale universities, MIT, Motorola, Hewlett-Packard, Dell Computer, the United Nations, City of Phoenix, State of New York and NASA. The Technology Transfer T2ED.com web site began operation in February 1998.

Other Economic Development Initiatives

- During FY 1996-97, the CAO supported training of more than 200 teachers, students and business representatives in writing grant proposals to support regional grassroots economic development. A total of seven grants were written/reviewed during the period to support public education, a training center, a national park, a museum, and a minority-owned business. Winning grant proposals brought a total of $2.1 million into the region.
- Proposed the start-up of a spin-off training products business to area economic development investors in February 1998 through the Carlsbad Department of Development. CAO supported development of a business plan to create a training products business for the manufacturing field. CAO continues to identify other products and services with spin-off potential from WIPP.
- Provided design and writing consultation for Carlsbad Department of Development marketing materials and a business relocation guide, volunteer assistance to survey 215 area businesses for a business retention and expansion project, compilation of a geographic information system database, and survey development, analysis and tabulation for economic development and educational organizations.

- Served in a variety of community and business development efforts, including the United Way, Carlsbad MainStreet Project, Downtown Business Association, Rotary International, the Carlsbad Museum and Art Center, Carlsbad Chamber of Commerce and Carlsbad Department of Development. Provided management development and team-building seminars to area businesses and public education.

Future Prospects

- Continued support and development of spin-off businesses from WIPP products and services that fulfill identified needs in Southeastern New Mexico. These efforts support the development of Southeastern New Mexico as an international "lessons-learned center" for passing on knowledge, skills and abilities to others.
- Creating synergy for systematic expansion of regional economic prosperity by working with a variety of business and community development efforts that include local economic developers, downtown MainStreet projects, educational development, and business recruitment and retention.

Uranium Mill Tailings Remedial Action Project

History

Uranium ore has been mined in significant quantities for more than 40 years. Initially, the ore was mined by private companies for federal government use in national defense programs. After the 1950s, uranium was also needed as fuel for nuclear power plants.

When the mills shut down, they left behind large piles of uranium mill tailings, the sand-like material that remains after uranium has been extracted from the ore. Tailings contain 85 percent of the radioactivity present in the unprocessed uranium ore and small concentrations of naturally occurring materials that radioactively decay to radium and produce radon, a radioactive gas.

Levels of human exposure to radioactive materials from the piles are low; however, in some cases, tailings were used as construction materials before the potential health hazards of the tailings were recognized. In homes or other structures containing tailings, the radon gas can concentrate in enclosed spaces. The purpose of remedial action is to minimize or eliminate potential health hazards resulting from exposure of the public to residual radioactive materials at the former processing sites and at contaminated properties.

After determining that uranium mill tailings might pose a public health hazard, Congress passed Public Law 95-604, "The Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978," to clean up all inactive uranium mill sites that had been abandoned by the late-1960s. DOE was given the responsibility for stabilizing and controlling the tailings at 24 inactive sites in a safe and environmentally sound manner in accordance with EPA standards. The UMTRA Project Office was established in 1979 as part of the Albuquerque Operations Office.

Background

The UMTRA surface remediation project is located in Albuquerque, New Mexico, and is managed by 16 federal employees. Jacobs Engineering Group Inc. is the technical assistance contractor for the project, providing technical and management support to DOE. In FY 1997, Jacobs and its three teaming partner companies had 60 people in New Mexico devoted to the project at the start of FY 1997; that number had been reduced to 53 by year's end. Construction management support is provided by the remedial action contractor, MK-Ferguson Company, and its subcontractors, with staff levels moving from 650 employees at the beginning of the fiscal year to 222 at the end of September 1997.

The former processing sites being remediated by this project are located near Shiprock and Ambrosia Lake, New Mexico; Salt Lake City, Green River, and Mexican Hat, Utah; Canonsburg, Pennsylvania; Durango, Slick Rock (two sites), Gunnison, Naturita, Grand Junction, Rifle (two sites), 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).

In July, 1997, DOE determined that cleanup was not required at the two UMTRA sites at Belfield and Bowman, ND. This action was taken at the request

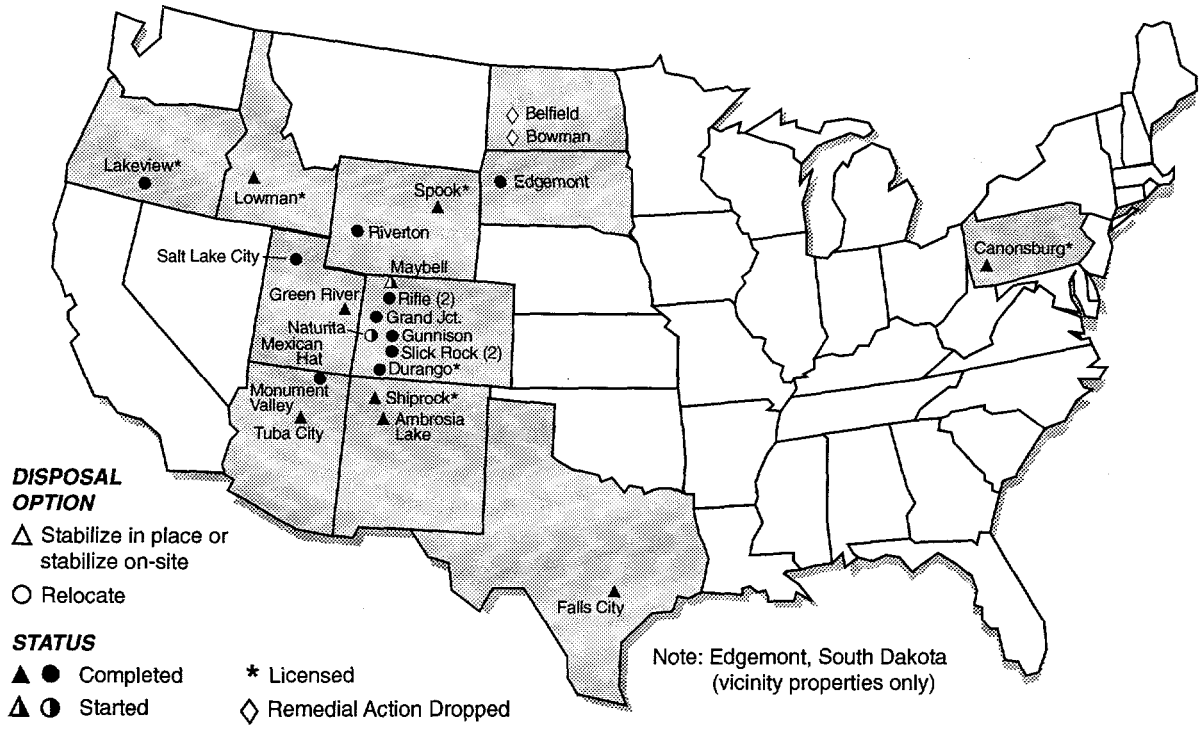


Figure 5. UMTRA Project Sites.

of the state of North Dakota because of minimal public support, limited state funding and the very small risk to the public and the environment. This reduced the number of UMTRA sites from 24 to 22.

Mission and Capabilities

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 the 22 designated inactive, privately owned, uranium milling and processing sites, and approximately 8,156 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 current U.S. Environmental Protection Agency (EPA) standards. The 1988 amendments to Public Law 95-604 also directed the DOE to conduct cleanup of ground water resources affected by contamination from UMTRA Project sites. Responsibility for the ground water cleanup was moved from Albuquerque to DOE's Grand Junction Office (GJO) in Grand Junction, Colorado, on October 1, 1995.

Achievements

- Project members saved $1.4 million during FY 1997 through DOE's Cost Reduction/ Productivity Improvement Program (CR/PIP). UMTRA team people have saved $77 million since the CR/PIP began in 1988.
- Work was completed at the two Slick Rock, Colorado, sites in FY 1997. All 22 sites are now complete except for Maybell and Naturita in Colorado. These two remaining sites are scheduled to be completed in September 1998.
- Obtained National Regulatory Commission (NRC) licensing of four sites through the end of FY 1997, bringing the total licensed to 11. These were Falls City, Texas, in July; and Gunnison, CO, and Mexican Hat and Salt Lake City, Utah, in September. In addition, the NRC certified the processing sites at Grand Junction, CO, and Monument Valley, AZ, during the year. By September 1998, 20 sites are scheduled to be licensed by the NRC.
- Completed 8,031 of the 8,156 vicinity properties eligible for remedial action under the UMTRA Project. These properties are residences, private businesses and open lands where uranium tailings were used as construction materials.
- Congress passed a bill extending the authority of the Secretary of Energy to perform UMTRA

remedial actions by two fiscal years through September 30, 1998.

Future Prospects

As the world's largest materials management project ever undertaken to reduce or eliminate risk to the general public from exposure to potentially hazardous radioactive materials, the UMTRA Project will have encapsulated and isolated almost one-fourth of all uranium mill tailings generated in the United States by the time cleanup is completed in September 1998. This amounts to more than 42 million cubic yards of material!

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 FY 1997, 107,000 guests visited the museum.

Ross Aviation

Ross Aviation, Inc. is AL's support service contractor providing air cargo and passenger service. It utilizes base facilities located on KAFB, Albuquerque, New Mexico. All aircraft operate in support of the air service contract to Department of Energy and the aircraft are government owned. Services supported by Ross aviation, Inc. include cargo transports between production plants, national laboratories, test sites, and military facilities, and provides on demand special passenger and cargo flights. The AL fleet of aircraft is maintained by Ross Aviation under the provisions of its FAA repair station certificate.

Ross Aviation, Inc. operates from a facility contiguous to the Albuquerque International Airport. The contractor employs approximately 80 people and has an annual operating budget of about $10 million. The AL fleet consists of three DC-9 jet transport, two DHC-6 Twin Otter turboprop airplanes, one B200C King Air turboprop and one LR-35A Learjet. 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, Inc. (WSI) and is located on the old Manzano Base Administration Area of KAFB, Albuquerque, New Mexico. The S&SCTA is chartered to ensure efficient, effective and standardized crosscutting training to DOE and contractor personnel located at DOE sites through out the country in these safeguards and security disciplines: protection program operations, program planning and management, nuclear materials control and accountability, information security and personnel security. Training services are also extended to non-safeguards and security personnel within DOE, other federal agencies, and state, local and international governmental agencies. The New Mexico State Police, Albuquerque Police Department, and Bernalillo County Sheriff Office are training partners with the S&SCTA.

It is staffed by four DOE and over 90 WSI contractor employees, and supplemented by its subcontractor Battelle Memorial Institute. The curriculum includes over 150 courses, including 45 that are accredited by the American Council on Education. Over 50 traditional classroom courses have been converted to multi-media Distance Learning formats to take the training to the student at the work site. These formats include: on-line via the Internet, CD-ROM, audio/video tape, televideo-conferencing, and live interactive television via satellite. The use of these technologies garnered the S&SCTA the Vice Presidential "Hammer Award" for efficiency, the DOE "Honor Roll Award" for quality, and the DOE recognition as the first Training Center of Excellence in 1997.

The Safeguards and Security Central Training Academy has the capacity to train anyone, on anything, anytime, and anywhere and continues to expand its training services to meet customer needs everyday.

The AL Transportation Safeguards Division conducts extensive training for special Agents (Couriers) in a remote site on KAFB and Ft. Chaffee, AR. The Transportation Safeguards

Training Center (TSTC) utilizes two primary contractors (Star Mountain, Inc. and AlliedSignal Inc.) to provide services. FY 1997 federal jobs for this program are approximately 13; contractors employ approximately 49.

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—65 percent are minority-owned small and disadvantaged businesses (commonly referred to as 8(a) firms). The FY 1997 expenditure for support services was approximately $57.0 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 AL, all 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 9, 10, 11, and 12. The expenditure patterns (production functions) of DOE in New Mexico, as shown in column 38 of Table 13, were derived as follows: New Mexico expenditures and operating budgets for FY 1996 (Table 3) and FY 1997 (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 1996 and FY 1997 were also collected from AL and other DOE 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 1996, LANL, with the two contractors, was funded at slightly more than $1.1 billion and SNL at slightly over $1.4 billion. In FY 1997, the LANL budget increased to about $1.25 billion while SNL decreased to less than $1.38 billion. Total expenditures in New Mexico in FY 1997 were $960 million at LANL (including the two on-site contractors) and $887 million at SNL as compared to $868 million and $920 million, respectively, in FY 1996.

Other DOE contractors in New Mexico include ITRI, Ross Aviation, Jacobs Engineering Group, Inc., MK-Ferguson Company (UMTRA), Johnson Controls (LANL), Westinghouse Electric (WIPP), and Allied Signal. Each contractor assigned their instate expenditures to one of 37 industrial sectors as summarized in Tables 3 and 4 and detailed in Appendix Tables 9-12.

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), Lockheed Martin Speciality Components, Inc, MACTEC-ERS and WASTREN.

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 instate expenses of DOE/AL, the instate contractors, and the expenditures in New Mexico by out-of-state contractors and field offices). DOE expenditures in New Mexico for the FY 1983-1997 period are summarized in Figure 6. The instate spending from the DOE/New Mexico total has increased steadily since 1983, to $2.2 billion expended in FY 1994 and then decreased to less than $2.1 billion in FY 1995 and remained at about $2.1 billion through FY 1997.

Total DOE/New Mexico instate expenditures (the initial respending of total operating and capital budgets) amounted to over $2.1 billion, or about 72 percent of the total budget in FY 1996 (Table 3). In FY 1997, instate expenditures were about 73 percent ($2.1 billion) of the total DOE/New Mexico budget of over $2.9 billion (Table 4). As a result, slightly over $806 million went to out-of-state

Table 3. DOE NM Expenditures (in thousands of dollars) by Sector and Total Operating Budget, US DOE Offices and Total Expenditures, FY 1996.

Sector	USDOE/AL	SNL (b)	LANL (c)	WIPP (d)	UMTRA (e)	ITRI (f)	Other Support Contractors (g)	Other DOE Offices (h)	Total FY 96
1. Livestock & Livestock Products									
2. Other Agricultural Products		2							2
3. Forestry & Fishery Products		5							5
4. Agriculture, Forestry & Fishery Services		684	1						685
5. Mining, Crude Petroleum & Natural Gas		(70)	1,139						1,069
6. Construction	4,979	42,844	14,855	4,417		1,181	51		68,327
7. Ordnance & Chemical Manufacturing		2	231						233
8. Food & Kindred Products Manufacturing			245						245
9. Textiles Products & Apparel Manufacturing		32	42						74
10. Lumber & Wood Products Manufacturing			232						232
11. Paper & Publishing Manufacturing		294	179						473
12. Petroleum Refining & Products Manufacturing		180	210	1			328		719
13. Glass, Stone & Clay Products Manufacturing		10	18						28
14. Primary & Fabricated Metals Manufacturing		5,148	3,225	171	10		2,550		11,095
15. Computer, Office & Service Equipment Manuf.		8,881	4,507	118			227	139	13,883
16. Electrical Equipment Manufacturing		1,597	12,211				1,204		15,012
17. Scientific Instruments Manufacturing		467						154	621
18. All Other Manufacturing		344	150				385	200	1,079
19. Motor Freight Transport & Warehousing		246	27	109				3	384
20. All Other Transportation		1,257	229	624				206	2,316
21. Communication	2,364	6,876	3,213		15	6	9	157	12,639
22. Electric & Gas Utilities	905	13,691	22,657	751	7	594	193	126	38,923
23. Water & Other Utilities	13	647	98	478		9	10	18	1,274
24. Wholesale Trade		27,977	43,713	7,259	2				78,951
25. Retail Trade	1,390	37,784	72,512	846	220	1,422	304	1,135	115,614
26. Finance, Insurance & Real Estate		2,800	1,452	292	742	10	448	937	6,682
27. Hotel Restrnt. & Other Personal Services		719	1,136	438	17		177	638	3,125
28. Data Processing & Computer Services		23,764	17,559	1,431	59	174		40	43,027
29. Management & Consulting Services		30,967	20,698	284	5	665	142	12,448	65,211
30. Enginr., Architecture & Surveying Services		22,094	30,260	3,344	3,341	16		2,601	61,656
31. Other Business Services	19,063	65,030	19,580	7,448	220	726	1,454	9,668	123,191
32. Automobile & Other Repair Services		3,611	3,876	59	8	48	148	108	7,858
33. Amusement, Recreation & Video Services		879	185		24				1,088
34. Health, Education & Social Services		20,724	8,201	57	16	76		138	29,212
35. Government Services	4	24,471	13,739	7	32			212	38,465
36. Local Government	3,716	18,890	3,640	1,590	248	10	362	201	28,659
37. State Government	7,544	29,041	6,108	3,228	600	20	1,231	399	48,170
38. United States Department of Energy (a)									
39. Households	90,090	527,824	561,564	32,720	6,330	8,247	20,275	6,265	1,253,315
Total New Mexico Expenditures	130,067	919,711	867,694	65,674	11,897	13,204	29,500	35,794	2,073,540
Total Operating and Capital Budget	130,067	1,426,472	1,112,160	83,630	18,890	16,594	39,261	37,165	2,864,240

a. Any transfer of money for services or products between specified activities is counted only in the activity of the last receiving agency.
b. Includes Lockhead Martin (SNL)
c. Includes University of California (LANL), PT-LA and Johnson Control
d. Includes Westinghouse
e. Includes Jacobs Engineering Group and M-K Ferguson Co
f. Includes Lovelace Bio. & Research Institute
g. Includes Martin Marietta Specialty Components, Inc., and other contractors
h. Includes Idaho, Nevada, Oak Ridge and other Operations Offices

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 36 percent, and others the remaining 3 percent.

The FY 1996 and FY 1997 New Mexico funding, instate expenditures, and employment by major entity, (excluding combined major on-site contractor effects), are presented in Table 5. In FY 1997, Lockheed Martin (SNL) had funding and instate expenditures of $1.38 billion and $886.8 million, respectively. University of California (LANL not including maintenance and security construction) followed with $1.14 billion funding and $863.6 million instate spending. DOE/AL was third with $138.2 million in funding and instate spending.

DOE/New Mexico expenditures by major sectors in FY 1997 were personnel ($1.3 billion), services ($366 million), trade ($213 million), government ($103 million), construction ($48 million), manufacturing ($42 million), and other sectors ($60 million) (Table 6). About 61 percent of

Table 4. DOE NM Expenditure (in thousands of dollars) by Sector and Total Operating Budget, US DOE Offices and Total Expenditures, FY 1997.

Sector	USDOE/AL	SNL (b)	LANL (c)	WIPP (d)	UMTRA (e)	Other Support Contractors (f)	Other DOE Offices (g)	Total FY 97
1. Livestock & Livestock Products								
2. Other Agricultural Products			10					10
3. Forestry & Fishery Products		9						9
4. Agriculture, Forestry & Fishery Services		280						280
5. Mining, Crude Petroleum & Natural Gas		211	1,801					2,012
6. Construction	5,215	24,355	15,788	2,298				47,657
7. Ordnance & Chemical Manufacturing			99					99
8. Food & Kindred Products Manufacturing			205					205
9. Textiles Products & Apparel Manufacturing		16	23					39
10. Lumber & Wood Products Manufacturing			136					136
11. Paper & Publishing Manufacturing		236	222					458
12. Petroleum Refining & Products Manufacturing		(1)	448			483		929
13. Glass, Stone & Clay Products Manufacturing		14	482					496
14. Primary & Fabricated Metals Manufacturing		2,318	4,809	569	10	2,749		10,445
15. Computer, Office & Service Equipment Manuf.		16,439	6,119			186	8	22,752
16. Electrical Equipment Manufacturing		1,323	1,859	105		785		4,071
17. Scientific Instruments Manufacturing		923	208			11	83	1,225
18. All Other Manufacturing		413	163				175	751
19. Motor Freight Transportation & Warehousing		289	(5)	23			2	315
20. All Other Transportation		19	108	2,177			123	2,427
21. Communication	2,482	6,844	2,179	764	15	113	194	12,577
22. Electric & Gas Utilities	725	13,694	21,511	1,142	7	158	123	37,360
23. Water & Other Utilities	13	231	34	3		14	17	313
24. Wholesale Trade		24,382	51,223	8,690	2			84,295
25. Retail Trade	1,460	39,522	78,639	1,548	220	5,079	2,802	129,184
26. Finance, Insurance & Real Estate		1,972	861	347	742	415	897	4,940
27. Hotel Restaurant & Other Personal Services		840	514		17		837	2,197
28. Data Processing & Computer Services		29,802	74,987	321	59		40	105,161
29. Management & Consulting Services		27,075	15,092	296	5	696	1,502	44,688
30. Engineering, Architecture & Surveying Services		17,930	33,689	4,304	3,341	77	2,627	59,645
31. Other Business Services	20,016	56,296	25,519	9,171	220	2,267	10,248	123,685
32. Automobile & Other Repair Services		4,035	3,103	35	8	149	100	7,429
33. Amusement, Recreation & Video Services		869	293		24			1,162
34. Health, Education & Social Services		14,612	6,757		16	22	150	21,556
35. Government Services	4	32,618	601	29	32		336	33,595
36. Local Government	4,546	17,327	1,859	1,988	248	439	129	26,644
37. State Government	6,820	26,786	3,031	2,970	600	1,190	988	42,434
38. United States Department of Energy (a)								0
39. Households	96,942	525,097	607,870	38,999	6,330	20,338	7,449	1,300,807
Total New Mexico Expenditures	138,223	886,777	960,237	75,778	11,897	35,172	28,829	2,131,988
Total Operating and Capital Budget	138,223	1,375,012	1,249,262	89,678	18,890	48,721	28,829	2,938,235

*Totals may not add due to rounding

a. Any transfer of money for services or products between specified activities is counted only in the activity of the last receiving agency.
b. Includes Lockhead Martin (SNL)
c. Includes University of California (LANL), PT-LA and Johnson Control
d. Includes Westinghouse
e. Includes Jacobs Engineering Group and M-K Ferguson Co
f. Includes Martin Marietta Specialty Components, Inc., Mason & Hanger-Silas Mason Co., Inc., Pantex, MACTEC-ERS, and WASTREN and other contractors
g. Includes Idaho, Nevada, Oak Ridge and other Operations Offices

expenditures in New Mexico went for salaries, wages, and benefits. Salaries and wages (without benefit costs) accounted for nearly 50 percent of total expenditures (Figure 7). Salaries and wages (including fringe benefits) increased by about $47 million between FY 1996 and FY 1997 (Table 6).

In FY 1997, about 17 percent of the DOE/NM expenditures went for services, 10 percent for trade, about 5 percent for government, 3 percent for other sectors, 2 percent for construction, and 2 percent for manufacturing (Figure 7).

The number of jobs increased from 19,881 in FY 1996 to 19,977 in FY 1997, for a net increase of 96 jobs (Table 5). The greatest increase occurred in the operation of LANL with an increase of 569 jobs. The 569 jobs include the two major contractors. Westinghouse had an increase of 9 jobs, other

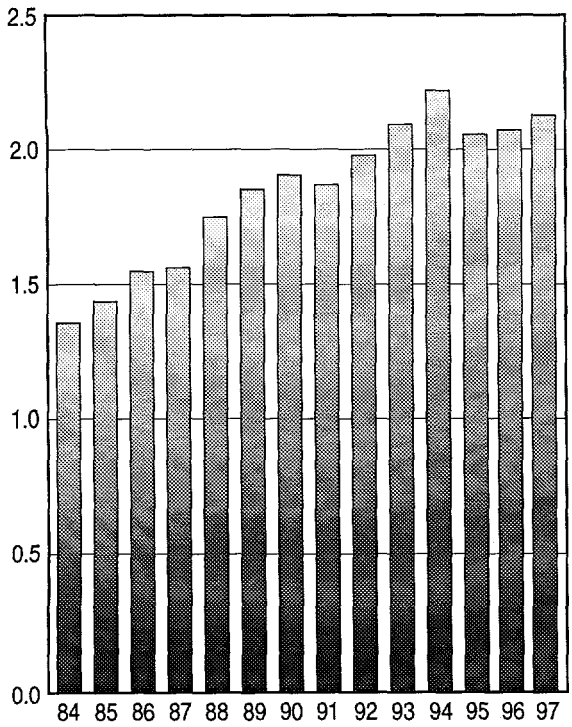


Figure 6. DOE Expenditures in New Mexico, FY 1984-1997.

contractors with an increase of 9 jobs and other DOE Operations offices an increase of 3 jobs. All other organizations had decreased employment between FY 1996 and FY 1997. SNL had the largest decrease with 216 fewer employees.

The largest number of jobs as a result of DOE/AL funding for FY 1997 was at LANL which had 8,461 employees, followed by SNL with 7,468, Johnson Controls Inc. with 1,435, and DOE/AL with 1,016 (Table 5). These four entities comprised just about 92 percent of the total jobs funded by DOE/AL in FY 1997 in New Mexico.

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 AL, all 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.

Table 5. DOE/New Mexico Funding, Instate Expenditures and Employment by Major Entity in New Mexico, FY 1996 and FY 1997.

	FY 1996			FY 1997		
Entity	New Mexico Funding	Instate Expenditures	New Mexico Employment	New Mexico Funding	Instate Expenditures	New Mexico Employment
	--millions of dollars--		(jobs)	--millions of dollars--		(jobs)
Martin Marietta (SNL)	1,426.5	919.7	7,684	1,375.0	886.8	7,468
Univ. of California (LANL)	1,008.0	776.9	8,198	1,143.0	863.6	8,461
US DOE Albuquerque Operations Office	130.1	130.1	1,063	138.2	138.2	1,016
Westinghouse Electric Corp (WIPP)	83.6	65.7	626	89.7	75.8	635
Johnson Controls (LANL)	81.3	67.9	1,136	76.9	70.5	1,435
Allied Signal	24.9	21.9	290	30.8	22.5	287
PT-LA	22.9	22.9	385	29.4	26.1	392
Other US DOE Operations Offices	22.5	22.5	13	13.9	13.9	16
Lovelace Medical Foundation (ITRI) (a)	16.6	13.2	188	0.0	0.0	0
Jacob's Engineering Group Inc. (UMTRA)	14.6	7.6	48	4.8	3.3	49
Ross Aviation Inc.	13.4	6.7	100	11.4	6.2	78
US DOE Nevada Operations Office	9.9	8.5	83	8.7	8.7	72
M-K Ferguson Company Inc. (UMTRA)	4.3	4.3	56	3.7	3.7	49
US DOE Idaho Operations Office	3.1	3.1	2	3.0	3.0	1
US DOE Oak Ridge Operations Office	1.7	1.7	9	3.2	3.2	9
Other Contractors New Mexico	0.9	0.9		6.6	6.6	9
Total	2,864.3	2,073.6	19,881	2,938.2	2,132.0	19,977

a. Lovelace was privatized in FY 1996, therefore is not part of the direct impacts of DOE NM on the in FY 1997 and thereafter.

Table 6. DOE/New Mexico Expenditures in New Mexico by Major Sector, FY 1996 and FY 1997.

Sector	FY-1996 thousands of dollars	FY-1996 (%)	FY-1997 thousands of dollars	FY-1997 (%)	FY-1996 & FY-1997 Difference thousands of dollars
I. Personnel					
A. Salaries & Wages	1,034,641	49.9	1,055,303	49.5	20,662
B. Benefits	218,674	10.5	245,504	11.5	26,830
Total	1,253,315	60.4	1,300,807	61.0	47,492
II. Construction	68,327	3.3	47,657	2.2	(20,670)
III. Manufacturing	44,077	2.1	41,607	2.0	(2,470)
IV. Trade	194,564	9.4	213,479	10.0	18,915
V. Services	334,368	16.1	365,524	17.1	31,156
VI. Government					
A. Local Government	28,659	1.4	26,644	1.2	(2,015)
B. State Government	48,170	2.3	42,434	2.0	(5,736)
C. Government Services	38,465	1.9	33,595	1.6	(4,870)
Total	115,294	5.6	102,672	4.8	(12,622)
VII. Other Sectors					
A. Agriculture	692	0.0	298	0.0	(394)
B. Mining	1,069	0.1	2,012	0.1	943
C. T.C.U. (a)	55,153	2.7	52,992	2.5	(2,161)
D. F.I.R.E. (b)	6,682	0.3	4,940	0.2	(1,742)
Total	63,595	3.1	60,242	2.8	(3,353)
TOTAL EXPENDITURES*	2,073,540	100.00	2,131,988	100.0	58,448

*Totals may not add due to rounding.

a. Transportation, communication, and utilities.

b. Finance, Insurance, Real Estate.

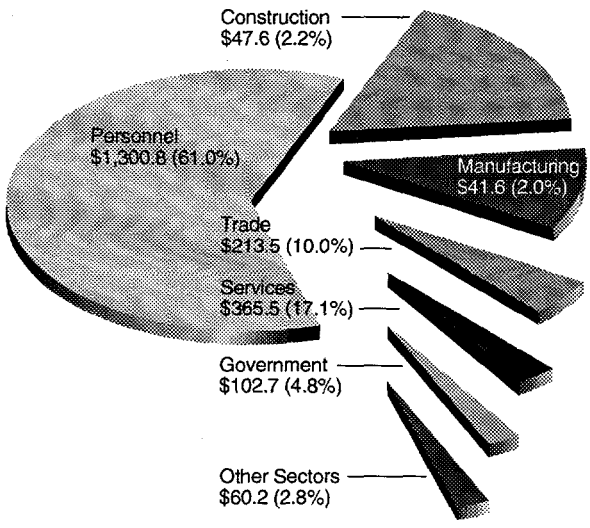


Figure 7. DOE Expenditures (millions of dollars) in New Mexico by Major Sector, FY 1997.

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).

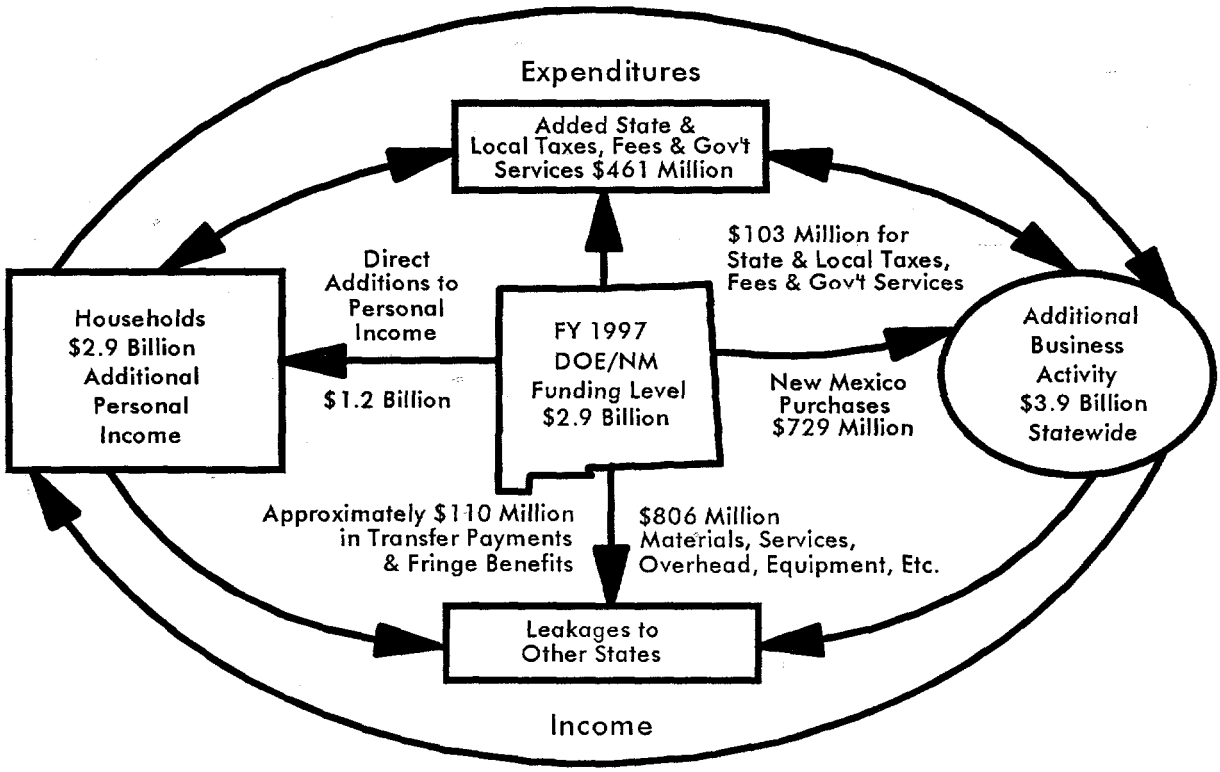


Figure 8. DOE Economic Impact on New Mexico, FY 1997.

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 New Mexico. This injection of money affects economic activity directly—that is, the effect precisely equals the amount allocated to DOE/New Mexico (slightly more than $2.9 billion).

Caution should be exercised when comparing economic impacts between FY 1996 and FY 1997 with prior years published in reports by Lansford et al. (1997, 1996, 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. The I/O model was rebased for the FY 1997. FY 1996 analysis was revised using the new model. The fringe benefits coefficients in the I/O model were updated. Also, caution should be exercised when comparing economic impacts among FY 1991 to FY 1995 with fiscal years prior to FY 1991 because new technical information was released by the BEA Department of Commerce. I/O models were used to estimate the impacts. New technical information released by the BEA, U.S. Department of Commerce in 1998 again was incorporated in the FY 1996 and FY 1997 I/O models presented in this report.

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: nearly $1.2 billion and $729 million, respectively for FY 1997 (Figure 8). Payments to state and local governments for taxes, services, and fees amounted to $103 million in additional revenues. A large portion ($806 million) of the initial spending flowed out of state. Respending by instate businesses and purchases by households and state and local government eventually brought the total private business impacts to $3.9 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 over $2.9 billion and state and local government tax revenues and government services and fees expanded to $461 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 1997, an estimate of the total state economic activity is $91.2 billion. 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. The total impact of $10.2 billion in economic activity generated by DOE/AL accounted for about 11 percent or more than $1 of every $9 of economic activity statewide of the estimated $91.2 billion total economic activity in the state (Table 7). Thus, DOE/AL is an important economic factor in the state of New Mexico. DOE/New Mexico directly added over $2.9 billion to the total economy in FY 1997 and nearly $2.9 billion in FY 1996. 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 1997 was 3.48. This indicates, for every $1 spent by DOE/AL and contractors another $2.48 was generated in the state, for a total impact of $3.48 in FY 1997. The economic activity multiplier for FY 1996 was 3.43 for a total economic impact of $9.81 billion on the state of New Mexico.

In FY 1996, the total economic impact of DOE/New Mexico was estimated to be $9.8 billion

Table 7. DOE/New Mexico's Influence on New Mexico's Economy, FY 1997.

		FY 1997		
Economic Measure	Revised FY 1996 DOE/NM	DOE/New Mexico	Total State	DOE as % of State
	---- billions of dollars----			
Economic Activity				
Direct Expenditures	2.86	2.94		
Indirect and Induced (a)	6.95	7.29		
Total Economic Activity	9.81	10.23	91.2	11.2
Economic Activity Multiplier	3.43	3.48		
Personal Income				
Gross Labor Costs	1.25	1.30		
Net Wages and Salaries	1.15	1.19		
Indirect and Induced (a)	1.63	1.71		
Total Personal Income	2.77	2.90	33.9(b)	8.6
Personal Income Multiplier	2.42	2.43		
Employment				
Direct	19,881	19,977		
Indirect and Induced (a)	52,251	53,085		
Total Employment	72,132	73,062	820,469(c)	8.9
Employment Multiplier	3.63	3.66		

a. FY 1996 results based on FY 1997 econometric model.
b. BEA April 1997 Preliminary.
c. New Mexico Department of Labor, Table C, March, 1998.

or about 11 percent of the total state economic activity (Table 7).

Appendix Table 16 gives the indirect economic impacts on private and public sectors for FY 1997. 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 (7 percent), health, education and social services (5 percent), wholesale trade (5 percent), electric and gas utilities (5 percent), hotel restaurant (5 percent), and construction (4 percent).

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 2.43 for FY 1997 (Table 7) and 2.42 for FY 1996: for every $1 of personal income from DOE/New Mexico for labor, another $1.43 was generated in the state in FY 1997.

Application of the income multiplier of 2.43 to the direct net personal income figure of nearly $1.2 billion (92 percent of wages, salaries and benefits) yields a total impact of $2.9 billion income created in the state by DOE/New Mexico activity. This compared to a total impact of $2.8 billion in FY 1996. In 1997, the BEA estimated the total personal income in the state of New Mexico was $33.9 billion (Table 7). DOE/New Mexico activities in the state accounted for about 9 percent, of the estimated $33.9 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 19,977 full-time jobs created by DOE/New Mexico in FY 1997, 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 3.66 for FY 1997 and 3.63 FY 1996: for every 100 jobs created by DOE/AL in New Mexico, another 266 jobs were supported in the state in FY 1997 and 263 jobs in FY 1996. This translates to a total impact of 73,062 jobs in FY 1997 and 72,132 jobs in FY 1996. The 73,063 jobs created or supported by DOE/New Mexico accounted for about 9 percent of total employment in the state for FY 1997 (Table 7) and about 10 percent in FY 1996.

Table 16 in the Appendix shows the DOE/New Mexico indirect employment impact on private and public sectors for FY 1997. The more labor-intensive sectors received a greater indirect employment impact. Retail trade has the largest indirect impact, about 29 percent. Other sectors with large indirect employment impacts include lodging and personal services (12 percent), finance, insurance and real estate (FIRE) (9 percent), local and state government (9 percent), health and social services (7 percent), wholesale trade (5 percent),and other business service (5 percent). About one of every 11 jobs in the state was directly or indirectly supported by DOE/New Mexico for FY 1997.

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 Science and Technology Advisory Council 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

The Civilian and Industrial Technology Program Office (CITPO) is responsible for energy technology programs and also serves as the single point of contact for collaborations between US industry and Los Alamos National Laboratory. CITPO's role is to promote the sharing that lies at the base of successful industrial collaborations—the sharing of employees, equipment, expertise, and technology.

Los Alamos National Laboratory is committed to providing New Mexico's communities with appropriate access to the Laboratory's vast array of technologies and to the strengths, talents, and expertise of its personnel. CITPO has an aggressive Small Business and Regional Initiative to facilitate partnerships between the Laboratory and small businesses and those owned by women and minorities. Partnerships between the Laboratory and New Mexico's institutions, businesses, and government organizations are seen as a crucial part of enhancing local economic well-being.

TeleMed

The Northern New Mexico Rural Telemedicine Project is one example of a Laboratory partnership that is improving regional communities. TeleMed is an Internet-based medical information management system. Using software technology developed at Los Alamos National Laboratory, healthcare providers participating in the TeleMed project can electronically share immunization records and basic patient encounter information, including medication records. Because Los Alamos software engineers designed TeleMed to have minimal infrastructure requirements, it is ideally suited to the rural environment of northern New Mexico. For example, the participating clinics need only phone lines, low-cost computers, and a minimal amount of software. Under the project, 16 rural clinics and two hospitals in northern New Mexico will gain the ability to share medical information securely over the Internet.

The US Department of Commerce National Telecommunications Information Administration officially awarded a two-year, $500,000 grant to the Northern New Mexico Rural Telemedicine Project. Another $500,000 in matching funds has been provided by the rural clinics, local businesses, Los Alamos National Laboratory, and a number of corporate partners, bringing the total value of the grant to $1 million.

Many key players have contributed to the success of the TeleMed partnership. The Northern New Mexico Community College (NNMCC) and Los Alamos National Laboratory share the leadership of the project. NNMCC is responsible for overall project management while Los Alamos is responsible for managing the technical aspects of the project, including software development. Clinical partners include Las Clinicas del Norte (3 clinics), Health Care Centers of Northern New Mexico (13 clinics), Española Medical Center, and Los Alamos Medical Center. Corporate partners include Citizen 1, Dallas Semiconductor, FileNet, Global Science and Technology, HubLink, Information Assets Management, and Intel. A number of agencies and individuals have also played key roles in supporting the project, including

US Senators Jeff Bingaman and Pete Domenici; the New Mexico Department of Health; the Los Alamos and Rio Arriba county governments; the UNM School of Medicine; Presbyterian Healthcare System; and the US Departments of the Army, Commerce, and Energy.

As the project matures, project leaders plan to add more capabilities to the system. To date, a number of important milestones have been met:

- An assessment was completed of the telecommunication, hardware, and training needs at the 18 participating healthcare providers.
- Ten fully equipped computer/servers, donated by Intel Corporation in Albuquerque, are being installed at participating clinics, some of which previously had no computers.
- A server was installed at NNMCC to house a web-site for the project and to provide e-mail between clinics.
- About one-third of the participating clinics have been connected to the Internet, and personnel at these clinics have been trained in the use of e-mail and Citizen 1, the medical Internet browser.
- Focus groups were held to determine the needs and preferences of the healthcare providers that will ultimately use the telemedicine system. The results are being incorporated into the TeleMed software that will be used in the project.
- A Job Task Analysis was completed to determine what is required to maintain immunization and patient encounter records. The results are being incorporated into the Telemed software that will be deployed.

Currently, the project is focused on:

- Connecting the balance of the participating clinics to the Internet and training personnel at these clinics to use e-mail and the medical Internet browser.
- Completing software development (i.e., modifying TeleMed to meet the needs of the participating healthcare providers by incorporating the results of the focus groups and Job Task Analysis).

Business Development

Small Business and Entrepreneurial Initiatives

The Small Business Initiative (SBI) has been funded by DOE Defense Programs Headquarters since FY 1993 to provide small-businesses access to the technical expertise of a DOE national laboratory. In FY 1996, Los Alamos National Laboratory's SBI focused the majority of its funds on business development in north-central New Mexico. The Laboratory works in a variety of ways with the small business sector.

The SBI North-Central New Mexico Economic Impact Program supports an average of 10 development projects with regional small businesses yearly. Two new Los Alamos companies have recently been launched through this program: (1) Energy-Related Devices, and (2) Coyote Mining and Environmental Instruments, Inc.

Energy Related Devices

Energy Related Devices (ERD), a two-year old regional company, has just received a $1 million investment to bring its micro fuel cell technology to the prototype stage. In doing so, ERD has merged with Manhattan Scientifics, a company based in New York and Santa Fe. Bob Hockaday, ERD President, is a former Laboratory employee who took entrepreneurial leave more than three years ago to move his technology into the market-place.

CITPO's Technology Commercialization Office introduced Hockaday to investor Marvin Maslow who is committed to working with Los Alamos and will manufacture the fuel cell in Northern New Mexico, if at all possible. To meet its one year goal of a manufacturing prototype, the company will require up to 18 high-tech jobs. The Laboratory has also assisted ERD through a Cooperative Research and Development Agreement (CRADA) providing evaluation and testing of the fuel cell design and performance. This CRADA, in place since April 1996, is valued at $570k to date. The collaborative relationship will continue with funding being provided by the small business investor.

The micro fuel cell technology, to be used in small consumer electronic devices, will be revolutionary in that it will be smaller, cheaper, cleaner, and longer lasting than the batteries it would replace.

This longer-lasting energy source is possible because hydrocarbons such as ethanol store about 50 times the energy as the same weight in batteries. The manufacturing process uses a lithographic technique (similar to that used to produce computer chips) to produce the fuel cell. The fuel cells are produced in thin sheets which can be layered and placed inside small electronic devices, such as cellular phones.

Manhattan Scientifics, Inc. is also parent to Tamarack Storage Devices, another regional company, which is developing holographic storage media, also with technical support from Los Alamos National Laboratory researchers.

LIBS & Coyote Mining and Environmental Instruments, Inc.

Multiple players have helped to make a well-developed Los Alamos National Laboratory technology into a great success story for several local small businesses. In 1996 and 1997, Los Alamos National Laboratory researcher Dr. David Cremers won funding for two different projects with regional small businesses under the auspices of the Laboratory's SBI-funded Technology Maturation Program.

The technological basis for these projects is a Laboratory technology known as laser-induced breakdown spectroscopy (LIBS), which can locate valuable or hazardous substances in a variety of media (e.g., metal, water, soil, and air). To conduct an analysis, scientists first form a laser-spark plasma by focusing a laser beam in or on a material. To determine the elemental composition of the material, they detect and analyze the plasma light using methods of atomic emission spectroscopy. In less than one minute, the results of the analysis appear on a computer screen. LIBS technology can conduct accurate evaluations from as far as 80 feet away from an object. For the DOE complex, this technology will enable the quick detection of radioactively contaminated weapon components during pit remanufacture processes. Whether companies or DOE laboratories are searching for hazardous contaminants or beneficial elements, they need a technology that can help find such substances easily and quickly. The LIBS technology is making this possible.

During FY 1997, LIBS became the basis of a Los Alamos start-up company, Coyote Mining and Environmental Instruments, Inc. (CMEI). CMEI is a spin-off from a CRADA collaboration between Los Alamos National Laboratory and ICF Kaiser. ICF Kaiser negotiated a nonexclusive license which it has transferred to CMEI. ICF Kaiser will continue working with both the Laboratory and CMEI specifically as an end user of the technology. CMEI's first goal is to commercialize LIBS technology. The new company plans to manufacture and market the technology as the Field-Portable Analyzer. These probes, now adapted to a backpack system, will have a selected spectral region of approximately 200 nanometers. This means they can provide simultaneous detection of several elements. Applications for this instrument include mining (e.g., exploration, grade control in open pit and underground mines, and abandoned mine reclamation) and environmental restoration (e.g., characterization of sites, real-time monitoring of cleanup activities, and post-restoration). In late 1998, CMEI will work on developing a second LIBS analyzer specifically for the diamond industry. The company expects to employ as many as 10 people within the next five years.

In addition to the success of CMEI, LIBS technology has also provided a competitive advantage to two other New Mexico companies. The first of these, Science and Engineering Associates (SEA), Inc., with offices in Albuquerque and Santa Fe, collaborated with the Laboratory to develop the first commercial LIBS-based subsurface soil analyzer. A result of this work is that SEA used a Laboratory-owned LIBS instrument for cleanup activities at the FUSRAP (Formerly Utilized Site Remedial Action Program) site at Luckey, OH. The contract for this work was the result of SEA's collaboration with the Laboratory on the development of LIBS instruments. The potential for additional work is excellent. In 1997, the Technology Maturation project between SEA and LANL succeeded in upgrading the software program for LIBS which also helped the company. SEA now has a truck-mounted, cone-penetrometer system for detecting soil contaminants deep in the earth. SEA scientist Steve Saggese, a fiber optics expert, won an R&D 100 Award for a detection instrument based on LIBS technology. Together Saggese and Cremers

developed the idea of pit detection. The use of LIBS technology to monitor pit interiors for contamination will be extremely useful to the DOE complex.

The second company, F2 Associates, Inc. of Albuquerque, worked with Los Alamos National Laboratory on an earlier Tech Maturation project to develop a high speed analyzer based on LIBS for use with the company's laser-based coating removal system. F2 will manufacture the system in New Mexico, and it will be used in the removal of contaminants from DOE facilities and decommissioned nuclear reactors, and of paint from commercial aircraft.

Entrepreneurial Training

The Technology Commercialization Office (TCO), which is part of CITPO, was formed to create improved mechanisms for using Laboratory technologies to stimulate new business start-ups, attract entrepreneurs, create alternative job opportunities, and attract business and capital to the northern New Mexico region while continuing to serve the nation as a whole. As part of this initiative, the TCO sponsors workshops to encourage entrepreneurship in the region. The workshops are specifically designed for individuals without a business background who wish to learn more about key issues involved in the business start-up process. They are also aimed at Laboratory employees who wish to extend their technical creativity beyond the Laboratory.

Each workshop includes expert speakers in a key topic area and a case study of a New Mexico start-up business. A workshop entitled "Financing High-Tech Ventures," held in February 1997, attracted over one hundred interested participants from the Laboratory and surrounding communities. This workshop discussed the complex variety of financing alternatives (e.g., venture capital, debt financing, angel investment, and public offerings) to consider when starting a new venture. Key speakers included Dick Harding from Silicon Valley Bank, Hans Severins, the leader of the Silicon Valley Band of Angels, Tom Brennan of Albuquerque's MicroOptical Devices, and Monica Montoya, Director of the Santa Fe Small Business Development Center. The first workshop of 1998 will focus on the basics of writing business plans for high-tech ventures.

Limited Term Use of Laboratory Property

Los Alamos National Laboratory has created a service to allow New Mexico companies the use of specialized Laboratory equipment provided it is not needed for Laboratory mission purposes. The service is called the "Limited-Term Use of Laboratory Property ("Tulip") Program. New Mexico small businesses may borrow, free of charge, underutilized government property for research and development purposes. Computer hardware and software are not available under the Tulip program.

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 1942, 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 ensuring 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 Sandia and other similar laboratories were charged by the National Competitiveness Technology Transfer Act of 1989 to "enhance United States competitiveness in both domestic and international markets" by partnering with private-sector companies, Sandia had learned that teamwork with industry is a smart business practice. Sandia has participated in many hundreds of projects that have produced impressive benefits

to the industry partners and to Sandia, enhancing its ability to meet its DOE mission 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.

Many New Mexico companies will find Sandia's Small Business Initiative (described below) of special interest.

Small-Business Initiative

To make its resources more easily available to small businesses, Sandia has established a Small-Business Initiative (SBI). Through the SBI program, Sandia uses a number of types of agreements to provide access to small businesses: User Facility agreements allow small-business technical personnel to gain access to many of Sandia's facilities and equipment; Cooperative Research and Development agreement, in which the small business and Sandia collaborate on a project of mutual interest. (Both of these arrangements, which are also available to large companies, are described later in this text.) Technical Assistance projects (described immediately below) have been of special interest to small businesses. Sandia has just completed its 1000th technical assistance project. Sandia has participated in 357 technical assistance projects with New Mexico companies.

Technical Assistance

The Technical Assistance agreement allows Sandia to use its unique capabilities, expertise, and facilities to help small businesses solve technology-based problems. Technical assistance can take a variety of forms—technical consultation, education and training, technical information, and/or access to specialized or unique equipment.

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—up to $5 thousand per project. This type of technical assistance is limited to one project per year for each small business.

Economic Impact of Technical Assistance

A broad spectrum of small manufacturing firms, R&D companies, and scientific organizations with various technology needs have benefited from technical assistance projects with Sandia.

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.

Surveys are conducted immediately after a technical assistance case closes and again about one year after closure. The surveys 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. Some results of the most recent survey follow:

- The median total economic benefit cited was $30,000 per technical assistance case. Total economic impact is defined as the sum total (current and projected) of new revenues, avoidance of sales lost, and cost avoidance resulting from technical assistance.
- A broad distribution of values were reported by SBI customers for total economic impact--ranging from 0$ to $19,000,000.
- A median of two jobs were created per technical assistance.

A 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 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.

Sandia has participated in 438 technical assistance projects with companies in New Mexico.

In addition to technical assistance projects, 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. Such collaborations satisfy 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. Projects involve a broad range of technologies including materials and materials processing, advanced manufacturing and precision engineering, microelectronics and photonics, advanced computing and information technologies, modeling and simulation, robotics and intelligent systems, failure analysis and reliability technologies, and energy and environmental technologies.

Since our first CRADA was signed in June 1991, we have initiated 335 CRADAs with a total value of more than $850 million. Sandia has participated in 54 CRADAs with New Mexico companies.

Licenses

Sandia also issues licenses to its technologies. 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 promote the effective use of our technologies in as many ways as possible, we try to license a given technology non- exclusively or exclusively to different users for specific fields of use. Our aim is to remain flexible and take into account the unique circumstances of each technology and licensee.

Sandia granted 59 licenses this year and has granted a total of 28 licenses to companies in New Mexico.

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.

Sandia has signed more than 30 user-facility agreements with New Mexico companies.

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 Technology Ventures Corporation.

A nonprofit organization established in 1993 by Martin Marietta, now Lockheed Martin, Technology Ventures 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 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 1997, 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 490 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 490 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 1992 base year I/O model, the DOE/NMSU I/O model was updated from a 1987 base year to a 1992 base year for the FY 1996 and FY 1997 analysis. The revised I/O model used the same number of economic sectors (37) as the 1982 and 1987 based I/O models. The economic sectors were restructured to better reflect economic activity in the state of New Mexico; therefore, the results of the 1992 based I/O model are not comparable with the results from the 1977, 1982, and 1987 based I/O models. Compared to the previous DOE/NMSU I/O model agriculture, mining, and construction sectors were not changed. 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 sectors. Trade was left unchanged with 2 sectors: wholesale and retail. FIRE sectors were combined into one sector (sector 26). The service sectors

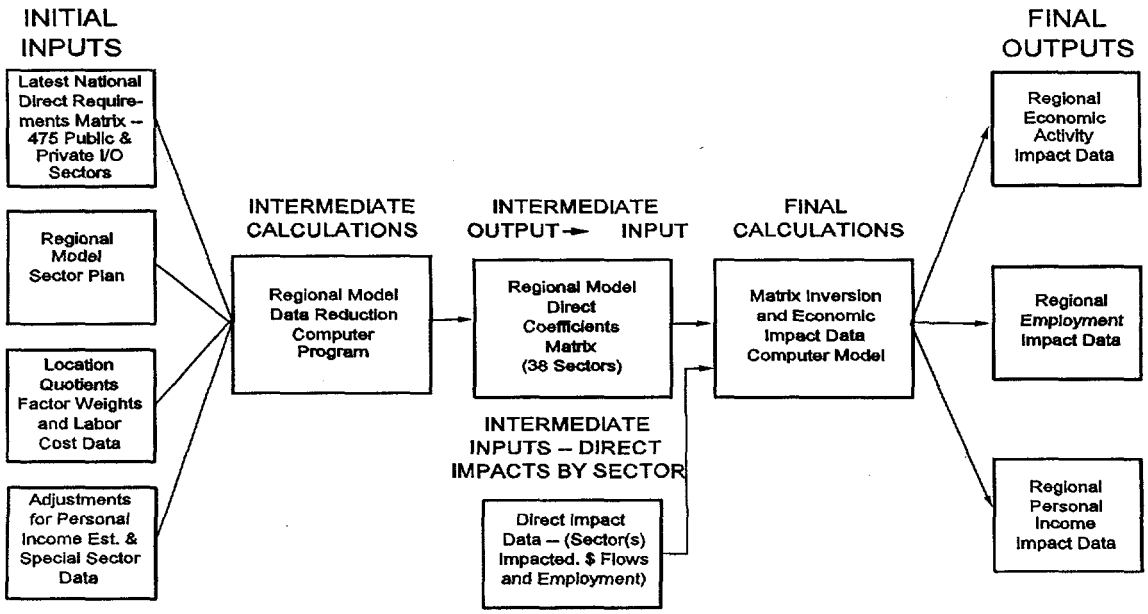

Figure 9. Input-Output Model Flow Diagram.

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 490 national sectors into 37 regional sectors required the calculation of location quotients and factor weights for the 490 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 490-by-490 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 1997 employment data for all sectors except agriculture. Output location quotients were calculated for the agriculture sectors using 1996 cash receipts and value of production data. Again, the national technical coefficients are from 1992. In using 1996-1997 data to derive a coefficients matrix for the state, it is assumed the production process did not change significantly between 1992 and the 1997 time period, and the techniques of production in the state of New Mexico for 1997 are similar to those in the U.S. for 1992.

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 490 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 490 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 490 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, ..., 490),

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 490 x 490 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, 1997, 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.

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.

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. The state and local government impacts are being updated and are being used in the FY 1997 analysis.

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 1996 and FY 1997 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 1996 and FY 1997 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 1996 and Tables 11 and 12 for FY 1997 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 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 1997 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. Fringe benefits are used to compute total unit labor costs i.e. cost per employee. The I/O model for the FY 1997 and FY 1996 analysis was revised. The fringe benefit coefficients in the I/O model were updated.

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 1997 is 3.48 (Table 8). This number is close to the column sum (3.45) 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 8. Type II Multipliers for DOE/New Mexico, FY 1996 and FY 1997.

Year	Economic Activity	Income	Employment
FY 1996	3.43	2.42	3.63
FY 1997	3.48	2.43	3.66

A multiplier of 3.48 for FY 1997 indicates that for every $1 spent by DOE on materials, labor, benefits, equipment, services, etc., another $2.48 is generated in the state for a total impact of $3.48.

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 1997 was estimated to be 2.43 compared to 2.39 for FY 1996. A multiplier of 2.43 for FY 1997 indicates that for every $1 of income generated by DOE/NM for labor and another $1.43 is generated in the state for a total impact of $2.43.

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 3.66 in 1997 (Table 8). This multiplier indicates that for every 100 jobs that are created by DOE, another 262 jobs are supported in the state.

Table 16 gives the DOE indirect employment impact, using Type II multipliers for FY 1997, by sector. The labor-intensive sectors obviously have a greater indirect employment impact. The "retail trade" sector has the largest indirect employment impact at 30 percent of the total. Other sectors with large indirect employment impact include FIRE (10 percent), lodging and personal services (9 percent), local and state government (7 percent), health, education and social services (8 percent), wholesale trade (4 percent), and other business services (4 percent).

The income multiplier is lower than the employment multiplier for both FY 1996 and FY 1997 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 9. DOE NM Expenditures (in dollars) by Sector and Operating Budget, Contractors, FY 1996.

Sector	University of California (LANL)	Johnson Control, Inc. (LANL)	Protection Technology Los Alamos (LANL)	Lockheed Martin (SNL)	Westinghouse Electric (WIPP)	Lovelace Bio. & Research Institute (ITRI)	Jacob's Engineering Group, Inc. (UMTRA)	M-K Ferguson Company, Inc. (UMTRA)	ROSS Aviation Inc.	Allied Signal Aerospace	Other Contractors in NM	Total Expenditures by Contractors In New Mexico
1. Livestock & Livestock Products												
2. Other Agricultural Products				1,610.35								1,610
3. Forestry & Fishery Products				4,714.44								4,714
4. Agriculture, Forestry & Fishery Services	1,355			683,971								685,326
5. Mining, Crude Petroleum & Natural Gas	1,139,429			(70,068)								1,069,361
6. Construction	14,855,037			42,844,246	4,417,291	1,180,756			51,026			63,348,356
7. Ordinance & Chemical Manufacturing	230,795			2,409.02								233,204
8. Food & Kindred Products Manufacturing	245,252											245,252
9. Textiles Products & Apparel Manufacturing	41,988			31,885								73,873
10. Lumber & Wood Products Manufacturing	232,458											232,458
11. Paper & Publishing Manufacturing	178,626			293,876								472,502
12. Petroleum Refining & Products Manufacturing	210,000			179,578	946				328,400			718,924
13. Glass, Stone & Clay Products Manufacturing	17,988			10,352								28,340
14. Primary & Fabricated Metals Manufacturing	3,225,357			5,148,277	171,145					2,549,960		11,094,739
15. Computer, Office & Service Equipment Manuf.	4,506,839			8,881,137	118,436			10,180	70,221	156,433		13,743,246
16. Electrical Equipment Manufacturing	12,210,668			1,596,646						1,204,221		15,011,535
17. Scientific Instruments Manufacturing				466,743								466,743
18. All Other Manufacturing	150,077			343,573						385,218		878,868
19. Motor Freight Transportation & Warehousing	4,661		22,080	245,909	108,822							381,472
20. All Other Transportation	71,402		157,473	1,256,840	624,288							2,110,003
21. Communication	2,725,282	488,068		6,876,220		5,800	14,390	127	8,684			10,118,571
22. Electric & Gas Utilities	22,449,786	206,732		13,691,003	750,703	593,799		6,927	25,454	167,682		37,892,086
23. Water & Other Utilities	24,715	73,532		646,962.00	478,447	9,234				10,182		1,243,072
24. Wholesale Trade	43,712,681			27,977,064	7,259,234			1,827				78,950,805
25. Retail Trade	72,512,075			37,783,607	845,961	1,422,044	68,054	152,406	297,800		6,402	113,088,349
26. Finance, Insurance & Real Estate	620,911	772,610	58,519	2,800,353	292,142	9,874	391,963	350,336	28,353	419,591		5,744,652
27. Hotel Restaurant & Other Personal Services	1,135,958			718,958	437,525		6,587	10,559			177,000	2,486,588
28. Data Processing & Computer Services	17,420,685	138,392		23,764,254	1,431,066	174,443	36,309	22,417				42,987,566
29. Management & Consulting Services	20,522,107		175,995	30,967,375	284,432	664,663		5,359	94,274		48,170	52,762,375
30. Engineering, Architecture & Surveying Services	30,260,225			22,093,625	3,344,171	15,640	3,341,215					59,054,876
31. Other Business Services	19,538,284		42,073	65,030,034	7,448,392	726,232	126,678	93,713		1,170,929	283,247	94,459,581
32. Automobile & Other Repair Services	1,550,648	2,325,284		3,611,175	59,077	47,735	1,207	6,989	12,825	135,607		7,750,547
33. Amusement, Recreation & Video Services	184,927			879,015			21,597	2,098				1,087,637
34. Health, Education & Social Services	6,669,764	1,531,489		20,723,697	57,332	76,131	1,443	14,273				29,074,129
35. Government Services	1,454,719	12,284,488		24,470,700.36	6,900		32,228					38,249,035
36. Local Government	750,871	2,267,347	622,269	18,890,476	1,590,047	9,978	209,989	38,281	61,762	290,110	10,508	24,741,639
37. State Government	1,156,104	3,920,331	1,031,102	29,040,714	3,228,276	20,259	530,461	69,182	125,397	1,089,428	15,763	40,227,016
38. United States Department of Energy (b)												
39. Households	496,863,400	43,920,221	20,780,456	527,823,595	32,719,584	8,247,155	2,825,142	3,505,262	5,598,281	14,272,023	405,114	1,156,960,233
Total New Mexico Expenditures	776,875,074	67,928,494	22,889,967	919,710,526	65,674,216	13,203,743	7,607,263	4,289,936	6,702,477	21,851,384	946,204	1,907,679,284
Total Operating and Capital Budget	1,008,000,000	81,270,335	22,889,967	1,426,471,988	83,630,430	16,593,842	14,600,000	4,289,936	13,391,548	24,923,355	946,204	2,697,007,605

a. Includes Lockheed Martin Specialty Components, Inc., Mason & Hanger-Silas Mason Co., Inc., Pantex, and MACTEC-ERS.
b. Any transfer of money for services or products between specified activities 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 10. DOE NM Expenditures (in dollars) by Sector and Total Operating Budget, US DOE Offices and Total Expenditures, FY 1996.

Sector	USDOE Albuquerque Operations Office	USDOE Idaho Operations Office	USDOE Nevada Operations Office	USDOE Oak Ridge Operations Office	Other USDOE Operations Offices	Total Expenditures by DOE Offices	Total Expenditures by Contractors	Total Expenditures by DOE In NM
1. Livestock & Livestock Products								
2. Other Agricultural Products							1,610	1,610
3. Forestry & Fishery Products							4,714	4,714
4. Agric., Forestry & Fishery Services							685,326	685,326
5. Mining, Crude Petroleum & Natural Gas							1,069,361	1,069,361
6. Construction	4,978,629					4,978,629	63,348,356	68,326,985
7. Ordinance & Chemical Manufacturing							233,204	233,204
8. Food & Kindred Products Manufacturing							245,252	245,252
9. Textiles Products & Apparel Manufacturing							73,873	73,873
10. Lumber & Wood Products Manufacturing							232,458	232,458
11. Paper & Publishing Manufacturing							472,502	472,502
12. Petroleum Refining & Products Manufacturing							718,924	718,924
13. Glass, Stone & Clay Products Manufacturing							28,340	28,340
14. Primary & Fabricated Metals Manufacturing							11,094,739	11,094,739
15. Computer, Office & Service Equipment Manufacturing					139,301	139,301	13,743,246	13,882,547
16. Electrical Equipment Manufacturing							15,011,535	15,011,535
17. Scientific Instruments Manufacturing					154,008	154,008	466,743	620,751
18. All Other Manufacturing			200,000			200,000	878,868	1,078,868
19. Motor Freight Transportation & Warehousing			2,500			2,500	381,472	383,972
20. All Other Transportation			141,408		64,802	206,210	2,110,003	2,316,213
21. Communication	2,363,742		156,534			2,520,276	10,118,571	12,638,846
22. Electric & Gas Utilities	905,259		125,672			1,030,931	37,892,086	38,923,017
23. Water & Other Utilities	12,887		18,482			31,369	1,243,072	1,274,441
24. Wholesale Trade							78,950,805	78,950,805
25. Retail Trade	1,390,437	201,841	200,000	732,913		2,525,191	113,088,349	115,613,540
26. Finance, Insurance & Real Estate			937,272			937,272	5,744,652	6,681,924
27. Hotel Restaurant & Other Personal Services			334,236		303,975	638,211	2,486,588	3,124,798
28. Data Processing & Computer Services		39,800				39,800	42,987,566	43,027,366
29. Management & Consulting Services					12,448,467	12,448,467	52,762,375	65,210,842
30. Engineering, Architecture & Surveying Services		2,601,190				2,601,190	59,054,876	61,656,066
31. Other Business Services	19,062,731			479,334	9,188,973	28,731,038	94,459,581	123,190,619
32. Automobile & Other Repair Services			100,000	7,692		107,692	7,750,547	7,858,239
33. Amusement, Recreation & Video Services							1,087,637	1,087,637
34. Health, Education & Social Services			123,502	14,644		138,146	29,074,129	29,212,275
35. Government Services	3,689	1,581	2,000	208,645		215,915	38,249,035	38,464,951
36. Local Government	3,715,637	3,211	183,127	2,384	12,514	3,916,871	24,741,639	28,658,510
37. State Government	7,543,868		371,802	4,768	22,715	7,943,154	40,227,016	48,170,170
38. United States Department of Energy (a)								
39. Household	90,090,133	215,091	5,651,437	250,069	148,313	96,355,043	1,156,960,233	1,253,315,276
Total New Mexico Expenditures	130,067,011	3,062,714	8,547,972	1,700,449	22,483,067	165,861,213	1,907,679,284	2,073,540,498
Total Operating and Capital Budget	130,067,011	3,062,714	9,918,878	1,700,449	22,483,067	167,232,119	2,697,007,605	2,864,239,724

a. Any transfer of money for services or products between specified activities 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 1997.

Sector	University of California (LANL) FY 1997	Johnson Control, Inc. (LANL) FY 1997	Protection Technology Los Alamos (LANL) FY 1997	Lockheed Martin (SNL) FY 1997	Westinghouse Electric (WIPP) FY 1997	Jacob's Engineering Group, Inc. (UMTRA) FY 1997	M-K Ferguson Company, Inc. (UMTRA) FY 1997	ROSS Aviation Inc FY 1997	Allied Signal Aerospace FY 1997	Other Contractors In NM (a) FY 1997	Total Expenditure by Contractors In New Mexico FY 1997
1. Livestock & Livestock Products											
2. Other Agricultural Products	9,537										9,537
3. Forestry & Fishery Products				8,805							8,805
4. Agriculture, Forestry & Fishery Services				279,723							279,723
5. Mining, Crude Petroleum & Natural Gas	1,801,304			210,746							2,012,050
6. Construction	15,788,016			24,354,962	2,298,335						42,441,313
7. Ordnance & Chemical Manufacturing	99,151			90							99,241
8. Food & Kindred Products Manufacturing	205,035										205,035
9. Textiles Products & Apparel Manufacturing	22,770			16,354							39,124
10. Lumber & Wood Products Manufacturing	135,595			300							135,895
11. Paper & Publishing Manufacturing	221,855			236,351							458,206
12. Petroleum Refining & Products Manufacturing	448,268			(1,442)				482,613			929,439
13. Glass, Stone & Clay Products Manufacturing	481,921			13,983							495,904
14. Primary & Fabricated Metals Manufacturing	4,808,717			2,318,190	569,038				2,748,811		10,444,756
15. Computer, Office & Service Equipment Manuf.	6,118,809			16,438,809					185,962		22,743,580
16. Electrical Equipment Manufacturing	1,858,624			1,322,693	105,112				785,053		4,071,482
17. Scientific Instruments Manufacturing	207,680			923,406					10,542		1,141,628
18. All Other Manufacturing	163,072			413,154							576,226
19. Motor Freight Transportation & Warehousing	(5,142)			289,393	22,674	6,380					313,305
20. All Other Transportation	107,992			19,022	2,177,246						2,304,260
21. Communication	1,573,043	606,026		6,843,822	764,034	1,335		10,693	102,671		9,901,624
22. Electric & Gas Utilities	21,511,000			13,694,396	1,141,998		7,255	29,200	128,920		36,512,769
23. Water & Other Utilities	15,741	18,719		231,409	2,737			6,678	7,577		282,861
24. Wholesale Trade	51,223,160			24,381,969	8,690,124						84,295,253
25. Retail Trade	78,638,710			39,522,373	1,548,177	22,924	110,468	345,502	212,774	4,520,863	124,921,791
26. Finance, Insurance & Real Estate	455,429	405,403		1,972,382	347,012	115,461	332,287	84,123	330,734		4,042,831
27. Hotel Restaurant & Other Personal Services	422,976	91,193		840,254		5,264	865				1,360,552
28. Data Processing & Computer Services	74,742,584	244,826		29,801,559	320,947	10,890					105,120,806
29. Management & Consulting Services	15,092,128			27,074,858	295,641	5,315	22,275	106,398		589,301	43,185,916
30. Engineering, Architecture & Surveying Servic	33,689,405			17,930,261	4,303,678	989,830	28,241		76,580		57,017,995
31. Other Business Services	25,518,588			56,296,219	9,170,640	61,828	106,964	5,049	1,420,339	842,044	93,421,671
32. Automobile & Other Repair Services	1,033,721	2,069,158		4,035,273	35,089	2,649	4,144	27,374	121,972		7,329,380
33. Amusement, Recreation & Video Services	293,131			868,568			380				1,162,079
34. Health, Education & Social Services	5,008,600	1,748,566		14,611,527		3,962	10,776	22,284			21,405,715
35. Government Services	601,279			32,618,305	28,600	7,124					33,255,308
36. Local Government	849,626	360,653	648,800	17,326,532	1,987,862	226,185	129,841	23,871	412,590	2,308	21,968,269
37. State Government	615,247	1,442,613	973,200	26,785,799	2,969,794	372,926	275,504	35,806	1,128,504	26,179	34,625,571
38. United States Department of Energy (b)											0
39. Households	519,862,000	63,532,220	24,476,000	525,096,541	38,998,794	1,450,930	2,661,157	4,971,010	14,794,239	573,092	1,196,415,983
											0
Total New Mexico Expenditures	863,619,572	70,519,377	26,098,000	886,776,585	75,777,532	3,283,003	3,690,157	6,150,601	22,467,268	6,553,787	1,964,935,882
Total Operating and Capital Budget	1,142,972,382	76,872,262	29,417,000	1,375,011,764	89,678,000	4,821,212	3,690,157	11,412,766	30,753,987	6,553,787	2,771,183,316
Number of Employees	8,461	1,435	392	7,468	635	49	49	78	287	9	18,863

a. Includes Martin Marietta Specialty Components, Inc., Mason & Hanger-Silas Mason Co., Inc., Pantex, MACTEC-ERS, and WASTREN.
b. Any transfer of money for services or products between specified activities is counted only in the activity of the last receiving agency.

Table 12. DOE NM Expenditures (in dollars) by Sector and Total Operating Budget, US DOE Offices and Total Expenditures, FY 1997.

Sector	USDOE Albuquerque Operation Offic FY 1997	USDOE Idaho Operation Offic FY 1997	USDOE Nevada Operation Offic FY 1997	USDOE Oak Ridge Operation Offic FY 1997	Other USDOE Operation Offic FY 1997	Total Expenditures by DOE Offices FY 1997	Total Expenditures by Contractors FY 1997	Total Expenditures by DOE In NM FY 1997
1. Livestock & Livestock Products							0	0
2. Other Agricultural Products							9,537	9,537
3. Forestry & Fishery Products							8,805	8,805
4. Agric., Forestry & Fishery Services							279,723	279,723
5. Mining, Crude Petroleum & Natural Gas							2,012,050	2,012,050
6. Construction	5,215,264					5,215,264	42,441,313	47,656,577
7. Ordnance & Chemical Manufacturing							99,241	99,241
8. Food & Kindred Products Manufacturing							205,035	205,035
9. Textiles Products & Apparel Manufacturing							39,124	39,124
10. Lumber & Wood Products Manufacturing							135,895	135,895
11. Paper & Publishing Manufacturing							458,206	458,206
12. Petroleum Refining & Products Manufacturing							929,439	929,439
13. Glass, Stone & Clay Products Manufacturing							495,904	495,904
14. Primary & Fabricated Metals Manufacturing							10,444,756	10,444,756
15. Computer, Office & Service Equipment Manufacturing					8,217	8,217	22,743,580	22,751,797
16. Electrical Equipment Manufacturing							4,071,482	4,071,482
17. Scientific Instruments Manufacturing					83,405	83,405	1,141,628	1,225,033
18. All Other Manufacturing			175,000			175,000	576,226	751,226
19. Motor Freight Transportation & Warehousing			2,000			2,000	313,305	315,305
20. All Other Transportation			109,249		13,658	122,907	2,304,260	2,427,167
21. Communication	2,481,929		193,618			2,675,547	9,901,624	12,577,171
22. Electric & Gas Utilities	724,810		122,519			847,329	36,512,769	37,360,098
23. Water & Other Utilities	12,887		16,785			29,672	282,861	312,533
24. Wholesale Trade							84,295,253	84,295,253
25. Retail Trade	1,459,959	203,809	200,000	2,289,741	108,225	4,261,733	124,921,791	129,183,525
26. Finance, Insurance & Real Estate			897,272			897,272	4,042,831	4,940,103
27. Hotel Restaurant & Other Personal Services			630,283	46,440	160,034	836,757	1,360,552	2,197,309
28. Data Processing & Computer Services		40,188				40,188	105,120,806	105,160,994
29. Management & Consulting Services					1,502,221	1,502,221	43,185,916	44,688,137
30. Engineering, Architecture & Surveying Services		2,626,553				2,626,553	57,017,995	59,644,548
31. Other Business Services	20,015,868			41,516	10,206,270	30,263,654	93,421,671	123,685,325
32. Automobile & Other Repair Services			100,000			100,000	7,329,380	7,429,380
33. Amusement, Recreation & Video Services							1,162,079	1,162,079
34. Health, Education & Social Services			138,000	12,050		150,050	21,405,715	21,555,765
35. Government Services	3,874		2,000	322,790	10,792	339,455	33,255,308	33,594,763
36. Local Government	4,546,467		129,210	70		4,675,747	21,968,269	26,644,016
37. State Government	6,819,700	5,093	882,800	13,923	86,492	7,808,008	34,625,571	42,433,579
38. United States Department of Energy (a)								
39. Household	96,942,060	121,972	5,104,931	492,253	1,729,796	104,391,012	1,196,415,983	1,300,806,995
Total New Mexico Expenditures	138,222,816	2,997,615	8,703,667	3,218,783	13,909,110	167,051,991	1,964,935,882	2,131,987,873
Total Operating and Capital Budget	138,222,816	2,997,615	8,703,667	3,218,783	13,909,110	167,051,991	2,771,183,316	2,938,235,307
Number of Employees	1,016	1	72	9	16	1,114	18,863	19,977

Table 13. DOE NM Direct Coefficients, FY 1997.

Sector	Direct Coefficient
1. Livestock & Livestock Products	0.000000
2. Other Agricultural Products	0.000003
3. Forestry & Fishery Products	0.000003
4. Agric., Forestry & Fishery Services	0.000095
5. Mining, Crude Petroleum & Natural Gas	0.000685
6. Construction	0.016219
7. Ordnance & Chemical Manufacturing	0.000034
8. Food & Kindred Products Manufacturing	0.000070
9. Textiles Products & Apparel Manufacturing	0.000013
10. Lumber & Wood Products Manufacturing	0.000046
11. Paper & Publishing Manufacturing	0.000156
12. Petroleum Refining & Products Manufacturing	0.000316
13. Glass, Stone & Clay Products Manufacturing	0.000169
14. Primary & Fabricated Metals Manufacturing	0.003555
15. Computer, Office & Service Equipment Manufacturing	0.007743
16. Electrical Equipment Manufacturing	0.001386
17. Scientific Instruments Manufacturing	0.000417
18. All Other Manufacturing	0.000256
19. Motor Freight Transportation & Warehousing	0.000107
20. All Other Transportation	0.000826
21. Communication	0.004281
22. Electric & Gas Utilities	0.012715
23. Water & Other Utilities	0.000106
24. Wholesale Trade	0.028689
25. Retail Trade	0.043966
26. Finance, Insurance & Real Estate	0.001681
27. Hotel Restaurant & Other Personal Services	0.000748
28. Data Processing & Computer Services	0.035791
29. Management & Consulting Services	0.015209
30. Engineering, Architecture & Surveying Services	0.020299
31. Other Business Services	0.042095
32. Automobile & Other Repair Services	0.002529
33. Amusement, Recreation & Video Services	0.000396
34. Health, Education & Social Services	0.007336
35. Government Services	0.011434
36. Local Government	0.009068
37. State Government	0.014442
38. United States Department of Energy	0.000000
39. Households	0.442717
Total New Mexico Expenditures	0.725601
Total Operating and Capital Budget	1.000000

a. Any transfer of money for services or products between specified activities 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 1997.

			INDUSTRY PURCHASING								
			1	2	3	4	5	6	7	8	9	10
	Livestock and Livestock Products	1	0.18554	0.00003	0.00715	0.00001	0.00000	0.00000	0.00005	0.08209	0.00053	0.00000
	Other Agricultural Products	2	0.25768	0.01568	0.00000	0.10817	0.00000	0.00146	0.00193	0.02420	0.00371	0.00000
	Forestry and Fishery Products	3	0.00000	0.00000	0.01771	0.00006	0.00000	0.00000	0.00009	0.00008	0.00137	0.00813
	Agricultural, Forestry, and Fishery Services	4	0.00002	0.00005	0.00059	0.00000	0.00025	0.00237	0.00042	0.00028	0.00010	0.00042
	Mining, Crude Petroleum, and Natural Gas	5	0.00005	0.00088	0.00000	0.00000	0.13635	0.00476	0.01177	0.00041	0.00023	0.00009
	Construction	6	0.01139	0.01104	0.00446	0.00670	0.01563	0.00345	0.00711	0.00447	0.00416	0.00337
	Ordnance & Chemical Manufacturing	7	0.00256	0.01187	0.00067	0.00091	0.00339	0.00477	0.03965	0.00154	0.00260	0.00168
	Food and kindred Products	8	0.03799	0.00000	0.01029	0.00000	0.00000	0.00000	0.00170	0.05075	0.00000	0.00000
	Textile Products and Apparel	9	0.00000	0.00000	0.00000	0.00000	0.00003	0.00004	0.00000	0.00000	0.06516	0.00086
	Lumber and Wood Products	10	0.00017	0.00015	0.00000	0.00000	0.00018	0.02532	0.00000	0.00005	0.00001	0.10868
	Paper and Publishing	11	0.00013	0.00176	0.00002	0.00022	0.00009	0.00059	0.00224	0.00773	0.00070	0.00092
	Petroleum Refining and Products	12	0.00518	0.01857	0.00305	0.00750	0.01099	0.01103	0.01291	0.00263	0.00208	0.00550
	Glass, Stone and Clay Products	13	0.00000	0.00118	0.00000	0.00000	0.00175	0.04350	0.00174	0.00001	0.00025	0.00408
	Primary and Fabricated Metals	14	0.00085	0.00161	0.00092	0.00013	0.00413	0.01686	0.00268	0.00079	0.00049	0.00668
	Computer, Office and Service equipment	15	0.00000	0.00000	0.00001	0.00001	0.00000	0.00032	0.00001	0.00001	0.00000	0.00000
	Electrical Equipment	16	0.00004	0.00004	0.00000	0.00018	0.00011	0.00843	0.00003	0.00004	0.00000	0.00056
I	Scientific Instruments	17	0.00000	0.00000	0.00085	0.00018	0.00008	0.00219	0.00019	0.00001	0.00000	0.00010
N	All Other Manufacturing	18	0.00030	0.00063	0.00021	0.00011	0.00024	0.00259	0.00334	0.00717	0.01036	0.00322
D	Transportation and Warehousing	19	0.01751	0.00892	0.00146	0.00619	0.00477	0.01281	0.02237	0.01256	0.00660	0.02273
U	All Other Transportation	20	0.01243	0.00325	0.00357	0.01482	0.00679	0.00343	0.01260	0.00888	0.00481	0.01021
S	Communication	21	0.00226	0.00197	0.00061	0.00413	0.00152	0.00314	0.00240	0.00144	0.00168	0.00199
T	Electric and Gas Utilities	22	0.01445	0.01129	0.00125	0.00025	0.04595	0.00306	0.02067	0.01207	0.01399	0.01379
R	Water and Other Utilities	23	0.00106	0.00504	0.00209	0.00000	0.00048	0.00074	0.00433	0.00116	0.00039	0.00124
Y	Wholesale Trade	24	0.04621	0.04382	0.00839	0.02072	0.01283	0.02518	0.04478	0.05042	0.03602	0.06551
	Retail Trade	25	0.00000	0.00000	0.00237	0.00038	0.00136	0.02964	0.00084	0.00260	0.00021	0.00112
S	Finance, Insurance and Real Estate	26	0.06130	0.07986	0.00918	0.01856	0.01031	0.01274	0.01163	0.01106	0.01506	0.01408
E	Hotel Restaurant and Other Personal Services	27	0.00037	0.00045	0.00530	0.00278	0.00544	0.00276	0.00679	0.00638	0.00816	0.00718
L	Data Processing and Computer Services	28	0.00035	0.00033	0.00093	0.00035	0.00089	0.00043	0.00168	0.00099	0.00091	0.00121
L	Management and Consulting Services	29	0.00000	0.00000	0.00153	0.00354	0.00125	0.00847	0.00429	0.00176	0.00157	0.00265
I	Engineering and Related Services	30	0.00000	0.00000	0.00000	0.00006	0.00771	0.05649	0.00692	0.00020	0.00016	0.00051
N	Other Business Services	31	0.00188	0.00368	0.03592	0.02683	0.00948	0.01366	0.03237	0.02523	0.04531	0.01304
G	Automobile and Other Repair Services	32	0.00635	0.01194	0.01407	0.01476	0.00268	0.01085	0.00922	0.00793	0.00509	0.00784
	Amusements, Recreation and Video Services	33	0.00000	0.00000	0.00006	0.00020	0.00012	0.00005	0.00033	0.00045	0.00022	0.00012
	Health, Education and Social Services	34	0.00046	0.00046	0.00072	0.00047	0.00053	0.00010	0.00076	0.00047	0.00053	0.00095
	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 ***		0.73646	0.34105	0.42493	0.60218	0.58372	0.66850	0.50940	0.48411	0.50582	0.59315

Table 14. Direct Coefficients, Input-Output Tables, US DOE, State of New Mexico, FY 1997 (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	0.00011	0.00000	0.00000
	Forestry and Fishery Products	3	0.00001	0.00000	0.00001	0.00000	0.00000	0.00000	0.00000	0.00005	0.00000	0.00000
	Agricultural, Forestry, and Fishery Services	4	0.00040	0.00013	0.00054	0.00034	0.00025	0.00087	0.00043	0.00027	0.00001	0.00000
	Mining, Crude Petroleum, and Natural Gas	5	0.00022	0.50230	0.06016	0.06452	0.00009	0.00005	0.00035	0.00037	0.00000	0.00021
	Construction	6	0.00648	0.00735	0.00677	0.00565	0.00676	0.01477	0.00642	0.00618	0.00390	0.00412
	Ordnance & Chemical Manufacturing	7	0.00117	0.00624	0.00699	0.00470	0.00027	0.00450	0.00114	0.00391	0.00024	0.00091
	Food and kindred Products	8	0.00000	0.00006	0.00000	0.00000	0.00000	0.00000	0.00015	0.00001	0.00000	0.00036
	Textile Products and Apparel	9	0.00001	0.00000	0.00000	0.00001	0.00000	0.00000	0.00064	0.00077	0.00001	0.00016
	Lumber and Wood Products	10	0.00085	0.00001	0.00113	0.00017	0.00006	0.00002	0.00011	0.00176	0.00002	0.00004
	Paper and Publishing	11	0.04407	0.00012	0.00250	0.00033	0.00047	0.00060	0.00137	0.00085	0.00089	0.00132
	Petroleum Refining and Products	12	0.00228	0.08422	0.01013	0.00275	0.00077	0.00083	0.00131	0.00322	0.04572	0.07397
	Glass, Stone and Clay Products	13	0.00001	0.00007	0.11362	0.00077	0.00002	0.00065	0.00348	0.00136	0.00002	0.00036
	Primary and Fabricated Metals	14	0.00126	0.00068	0.00314	0.11298	0.01213	0.01522	0.01179	0.01490	0.00067	0.00132
	Computer, Office and Service equipment	15	0.00009	0.00000	0.00000	0.00000	0.02164	0.00040	0.00125	0.00014	0.00000	0.00001
	Electrical Equipment	16	0.00003	0.00001	0.00001	0.00407	0.18441	0.12981	0.08192	0.00549	0.00018	0.00129
I	Scientific Instruments	17	0.00064	0.00007	0.00006	0.00012	0.00254	0.00003	0.01558	0.00352	0.00006	0.00007
N	All Other Manufacturing	18	0.00166	0.00072	0.00111	0.00162	0.00340	0.00195	0.00337	0.07746	0.00045	0.01368
D	Transportation and Warehousing	19	0.01232	0.00438	0.06165	0.01112	0.00249	0.00377	0.00430	0.00936	0.14556	0.00524
U	All Other Transportation	20	0.00754	0.03279	0.01772	0.00771	0.00551	0.00613	0.00460	0.00569	0.01607	0.06822
S	Communication	21	0.00415	0.00100	0.00251	0.00275	0.00306	0.00352	0.00419	0.00265	0.01063	0.01407
T	Electric and Gas Utilities	22	0.01086	0.08903	0.03634	0.01738	0.00664	0.01487	0.00854	0.01030	0.00689	0.00392
R	Water and Other Utilities	23	0.00078	0.00278	0.00150	0.00130	0.00089	0.00108	0.00060	0.00110	0.01243	0.00202
Y	Wholesale Trade	24	0.02301	0.03261	0.03074	0.04077	0.08085	0.04017	0.02878	0.04590	0.02490	0.02216
	Retail Trade	25	0.00070	0.00018	0.00135	0.00024	0.00030	0.00028	0.00064	0.00065	0.00437	0.00281
S	Finance, Insurance and Real Estate	26	0.01659	0.00949	0.01435	0.01484	0.01717	0.01757	0.01574	0.01559	0.02885	0.03111
E	Hotel Restaurant and Other Personal Services	27	0.00653	0.00284	0.00723	0.00716	0.00654	0.00703	0.00732	0.00743	0.00841	0.01428
L	Data Processing and Computer Services	28	0.00212	0.00130	0.00198	0.00153	0.00411	0.00399	0.00402	0.00269	0.00165	0.01842
L	Management and Consulting Services	29	0.00278	0.00175	0.00201	0.00206	0.00228	0.00303	0.01166	0.00368	0.00494	0.00488
I	Engineering and Related Services	30	0.00018	0.00221	0.00076	0.00126	0.00060	0.00352	0.00228	0.00122	0.00003	0.00033
N	Other Business Services	31	0.03098	0.00775	0.01274	0.01558	0.01850	0.02592	0.02598	0.01915	0.01605	0.03376
G	Automobile and Other Repair Services	32	0.00911	0.00875	0.01582	0.00772	0.00456	0.01316	0.00562	0.00949	0.05915	0.01087
	Amusements, Recreation and Video Services	33	0.00027	0.00009	0.00011	0.00010	0.00025	0.00025	0.00027	0.00022	0.00026	0.00027
	Health, Education and Social Services	34	0.00063	0.00029	0.00048	0.00063	0.00058	0.00130	0.00260	0.00127	0.00069	0.00097
	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 ***		0.55965	0.86695	0.75572	0.65574	0.72470	0.69256	0.53994	0.65439	0.80625	0.75525

Table 14. Direct Coefficients, Input-Output Tables, US DOE, State of New Mexico, FY 1997 (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	0.00010	0.00000	0.00079	0.00000
	Other Agricultural Products	2	0.00000	0.00000	0.00000	0.00008	0.00000	0.00001	0.00401	0.00001	0.00000	0.00001
	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	0.00016	0.00005	0.00000	0.00046	0.00097	0.00149	0.00138	0.00044	0.00042	0.00012
	Mining, Crude Petroleum, and Natural Gas	5	0.00000	0.19908	0.00000	0.00003	0.00001	0.00000	0.00003	0.00000	0.00000	0.00001
	Construction	6	0.02935	0.07489	0.09521	0.00402	0.00908	0.01537	0.01057	0.00254	0.00458	0.00139
	Ordnance & Chemical Manufacturing	7	0.00021	0.00065	0.00903	0.00021	0.00004	0.00007	0.00032	0.00004	0.00246	0.00001
	Food and kindred Products	8	0.00000	0.00000	0.00000	0.00044	0.00001	0.00000	0.05346	0.00000	0.00028	0.00000
	Textile Products and Apparel	9	0.00014	0.00000	0.00000	0.00045	0.00004	0.00000	0.00030	0.00000	0.00008	0.00000
	Lumber and Wood Products	10	0.00003	0.00002	0.00288	0.00034	0.00008	0.00007	0.00004	0.00007	0.00008	0.00012
	Paper and Publishing	11	0.00113	0.00015	0.00030	0.00540	0.00317	0.00175	0.00140	0.00342	0.00323	0.00111
	Petroleum Refining and Products	12	0.00093	0.01027	0.03080	0.00545	0.00478	0.00082	0.00260	0.00084	0.00289	0.00040
	Glass, Stone and Clay Products	13	0.00003	0.00001	0.00126	0.00007	0.00001	0.00019	0.00098	0.00001	0.00257	0.00008
	Primary and Fabricated Metals	14	0.00036	0.00083	0.00054	0.00169	0.00043	0.00014	0.00015	0.00017	0.00155	0.00043
	Computer, Office and Service equipment	15	0.00030	0.00025	0.00002	0.00010	0.00004	0.00014	0.00002	0.00936	0.00039	0.00005
	Electrical Equipment	16	0.00969	0.00010	0.00027	0.00513	0.00046	0.00015	0.00008	0.03641	0.01493	0.00008
I	Scientific Instruments	17	0.00007	0.00026	0.01536	0.00011	0.00007	0.00011	0.00003	0.00033	0.00022	0.00012
N	All Other Manufacturing	18	0.00070	0.00017	0.00486	0.00137	0.00136	0.00076	0.00268	0.00053	0.00092	0.00055
D	Transportation and Warehousing	19	0.00106	0.00182	0.00511	0.00315	0.00227	0.00575	0.00588	0.00120	0.00493	0.00364
U	All Other Transportation	20	0.00321	0.02099	0.00498	0.00495	0.00323	0.00381	0.00650	0.00427	0.00674	0.00194
S	Communication	21	0.09049	0.00117	0.01797	0.01245	0.00786	0.00882	0.00524	0.01705	0.01037	0.00568
T	Electric and Gas Utilities	22	0.00461	0.07453	0.02784	0.00980	0.02310	0.00671	0.02730	0.00359	0.00700	0.00492
R	Water and Other Utilities	23	0.00113	0.00073	0.06085	0.00155	0.00304	0.00293	0.00714	0.00034	0.00085	0.00059
Y	Wholesale Trade	24	0.00571	0.00732	0.02329	0.02017	0.00363	0.00270	0.02896	0.01887	0.00928	0.00161
	Retail Trade	25	0.00029	0.00037	0.00739	0.00246	0.00346	0.00039	0.00139	0.00023	0.00081	0.00018
S	Finance, Insurance and Real Estate	26	0.02171	0.01993	0.01753	0.03704	0.08302	0.12576	0.06093	0.03558	0.04146	0.03885
E	Hotel Restaurant and Other Personal Services	27	0.00605	0.00456	0.00553	0.00727	0.00880	0.00714	0.02232	0.00628	0.01353	0.00556
L	Data Processing and Computer Services	28	0.00795	0.00479	0.00204	0.00775	0.00377	0.01020	0.00204	0.04630	0.01742	0.00892
L	Management and Consulting Services	29	0.00379	0.00171	0.00433	0.01115	0.00560	0.01333	0.00845	0.00543	0.03526	0.03178
I	Engineering and Related Services	30	0.01036	0.00409	0.00103	0.00062	0.00021	0.00237	0.00001	0.00043	0.02397	0.06367
N	Other Business Services	31	0.03504	0.02191	0.03983	0.04196	0.05120	0.04324	0.03071	0.03692	0.04945	0.13099
G	Automobile and Other Repair Services	32	0.01152	0.00259	0.00675	0.01329	0.01082	0.01136	0.01117	0.01103	0.01102	0.00419
	Amusements, Recreation and Video Services	33	0.07719	0.00018	0.00013	0.00072	0.00052	0.00032	0.00398	0.00025	0.00050	0.00013
	Health, Education and Social Services	34	0.00104	0.00078	0.00042	0.00139	0.00063	0.00109	0.00137	0.00186	0.00126	0.00150
	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 ***		0.77122	0.60090	0.64538	0.66045	0.68530	0.66624	0.69914	0.69371	0.72750	0.76176

Table 14. Direct Coefficients, Input-Output Tables, US DOE, State of New Mexico, FY 1997 (continued).

			INDUSTRY PURCHASING									
			31	32	33	34	35	36	37	38	39	*Row Sums*
	Livestock and Livestock Products	1	0.00001	0.00000	0.00040	0.00003	0.00000	0.00151	0.00290	0.00000	0.00270	0.28385
	Other Agricultural Products	2	0.00001	0.00000	0.00104	0.00030	0.00000	0.00143	0.00273	0.00000	0.00424	0.42682
	Forestry and Fishery Products	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00073	0.00145	0.00000	0.00017	0.02987
	Agricultural, Forestry, and Fishery Services	4	0.00032	0.00040	0.00242	0.00129	0.00015	0.00084	0.00161	0.00010	0.00013	0.02049
	Mining, Crude Petroleum, and Natural Gas	5	0.00000	0.00001	0.00001	0.00002	0.11223	0.00000	0.00000	0.00068	0.00010	1.09503
	Construction	6	0.00160	0.00280	0.00965	0.01214	0.10703	0.08996	0.16832	0.01622	0.00340	0.79830
	Ordnance & Chemical Manufacturing	7	0.00008	0.00132	0.00154	0.00387	0.01529	0.00174	0.00028	0.00003	0.00000	0.13693
	Food and kindred Products	8	0.00000	0.00000	0.00306	0.00429	0.00000	0.00568	0.01043	0.00007	0.02022	0.19924
	Textile Products and Apparel	9	0.00009	0.00030	0.00023	0.00031	0.00000	0.00087	0.00121	0.00001	0.00419	0.07592
	Lumber and Wood Products	10	0.00012	0.00008	0.00020	0.00040	0.00000	0.00000	0.00000	0.00005	0.00002	0.14332
	Paper and Publishing	11	0.00403	0.00107	0.00135	0.00895	0.00035	0.01831	0.00532	0.00016	0.00190	0.12938
	Petroleum Refining and Products	12	0.00277	0.00884	0.00286	0.00286	0.09404	0.00998	0.00671	0.00032	0.01674	0.50955
	Glass, Stone and Clay Products	13	0.00011	0.00102	0.00001	0.00065	0.00000	0.00142	0.00235	0.00017	0.00025	0.18407
	Primary and Fabricated Metals	14	0.00043	0.00216	0.00028	0.00034	0.00227	0.01605	0.00195	0.00355	0.00025	0.24281
	Computer, Office and Service equipment	15	0.00024	0.00028	0.00002	0.00018	0.00000	0.00065	0.00000	0.00774	0.00988	0.05355
	Electrical Equipment	16	0.00226	0.00592	0.00039	0.00049	0.00000	0.00710	0.00323	0.00139	0.00059	0.50531
I	Scientific Instruments	17	0.00031	0.00047	0.00017	0.00385	0.00000	0.00600	0.00065	0.00042	0.00005	0.05490
N	All Other Manufacturing	18	0.00087	0.00514	0.00149	0.00254	0.00003	0.00754	0.00294	0.00026	0.00136	0.16962
D	Transportation and Warehousing	19	0.00213	0.00463	0.00179	0.00289	0.00401	0.00944	0.00061	0.00011	0.00261	0.43915
U	All Other Transportation	20	0.00333	0.00483	0.00241	0.00410	0.04213	0.01170	0.01687	0.00083	0.00492	0.40447
S	Communication	21	0.01034	0.00730	0.00670	0.00746	0.00280	0.02956	0.01998	0.00428	0.01684	0.35202
T	Electric and Gas Utilities	22	0.00343	0.00914	0.01942	0.01073	0.01988	0.01845	0.02022	0.01271	0.03040	0.67534
R	Water and Other Utilities	23	0.00050	0.00264	0.00281	0.00287	0.00199	0.00386	0.00643	0.00011	0.00369	0.14505
Y	Wholesale Trade	24	0.00515	0.02127	0.00989	0.01180	0.00907	0.00835	0.01133	0.02869	0.02514	0.97602
	Retail Trade	25	0.00093	0.00559	0.00097	0.00118	0.00000	0.01504	0.01753	0.04397	0.21406	0.36629
S	Finance, Insurance and Real Estate	26	0.03948	0.05302	0.05693	0.07888	0.01444	0.07003	0.07244	0.00168	0.12181	1.41561
E	Hotel Restaurant and Other Personal Services	27	0.00689	0.01148	0.00638	0.01244	0.00015	0.02603	0.01159	0.00075	0.06177	0.34490
L	Data Processing and Computer Services	28	0.00841	0.00229	0.00275	0.00601	0.01293	0.01562	0.00696	0.03579	0.00311	0.25493
L	Management and Consulting Services	29	0.01335	0.00809	0.00785	0.01562	0.00214	0.01952	0.01170	0.01521	0.00000	0.27842
I	Engineering and Related Services	30	0.00022	0.00009	0.00000	0.00019	0.00245	0.01692	0.00954	0.02030	0.00000	0.24091
N	Other Business Services	31	0.04517	0.02575	0.04428	0.04322	0.01356	0.01822	0.01312	0.04210	0.00311	1.14358
G	Automobile and Other Repair Services	32	0.00875	0.01556	0.01333	0.01084	0.00336	0.01302	0.00980	0.00253	0.03517	0.44106
	Amusements, Recreation and Video Services	33	0.00101	0.00024	0.06886	0.00138	0.00000	0.00781	0.00348	0.00040	0.02161	0.19234
	Health, Education and Social Services	34	0.00172	0.00170	0.00123	0.01244	0.00036	0.01996	0.01669	0.00734	0.06099	0.14867
	Government Services	35	0.00000	0.00000	0.00000	0.00000	0.00000	0.00903	0.00322	0.01143	0.01507	0.03875
	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	0.44272	0.02075	11.31112
	*** Column Sums ***		0.56608	0.48209	0.66701	0.84961	0.86783	0.89470	0.87781	0.73085	0.71729	

Table 15. Direct, Indirect, and Induced Coefficients, Input-Output Tables, US DOE, State of New Mexico, FY 1997.

			INDUSTRY PURCHASING								
			1	2	3	4	5	6	7	8	9	10
	Livestock and Livestock Products	1	1.23580	0.00232	0.01396	0.00465	0.00453	0.00537	0.00411	0.10962	0.00465	0.00459
	Other Agricultural Products	2	0.32749	1.01866	0.00736	0.11532	0.00528	0.00800	0.00670	0.05748	0.00883	0.00533
	Forestry and Fishery Products	3	0.00022	0.00016	1.01851	0.00032	0.00041	0.00057	0.00034	0.00028	0.00171	0.00955
	Agricultural, Forestry, and Fishery Services	4	0.00101	0.00078	0.00174	1.00104	0.00149	0.00368	0.00135	0.00107	0.00100	0.00150
	Mining, Crude Petroleum, and Natural Gas	5	0.03318	0.03027	0.02115	0.03131	1.20390	0.04816	0.05095	0.02438	0.02622	0.03384
	Construction	6	0.04682	0.03276	0.06037	0.03751	0.06984	1.04359	0.03753	0.03087	0.03119	0.03462
	Ordnance & Chemical Manufacturing	7	0.00871	0.01366	0.00215	0.00380	0.00586	0.00735	1.04288	0.00377	0.00423	0.00354
	Food and kindred Products	8	0.06180	0.00950	0.02616	0.01961	0.01826	0.02246	0.01818	1.07052	0.01687	0.01926
	Textile Products and Apparel	9	0.00215	0.00164	0.00235	0.00339	0.00306	0.00392	0.00277	0.00216	1.07256	0.00430
	Lumber and Wood Products	10	0.00178	0.00123	0.00185	0.00125	0.00237	0.02992	0.00125	0.00112	0.00106	1.12311
	Paper and Publishing	11	0.00523	0.00486	0.00488	0.00536	0.00522	0.00690	0.00698	0.01240	0.00520	0.00614
	Petroleum Refining and Products	12	0.03153	0.03294	0.01977	0.03279	0.03527	0.03845	0.03538	0.02071	0.02110	0.02979
	Glass, Stone and Clay Products	13	0.00342	0.00350	0.00408	0.00279	0.00679	0.05242	0.00467	0.00221	0.00253	0.00766
	Primary and Fabricated Metals	14	0.00464	0.00391	0.00440	0.00315	0.00912	0.02323	0.00605	0.00353	0.00323	0.01138
	Computer, Office and Service equipment	15	0.00455	0.00348	0.00455	0.00737	0.00624	0.00863	0.00596	0.00461	0.00617	0.00706
	Electrical Equipment	16	0.00434	0.00314	0.00488	0.00531	0.00546	0.01618	0.00479	0.00397	0.00450	0.00598
I	Scientific Instruments	17	0.00076	0.00060	0.00180	0.00101	0.00106	0.00329	0.00105	0.00069	0.00077	0.00097
N	All Other Manufacturing	18	0.00397	0.00281	0.00360	0.00380	0.00397	0.00719	0.00702	0.01091	0.01498	0.00748
D	Transportation and Warehousing	19	0.03646	0.01620	0.00861	0.01629	0.01482	0.02919	0.03468	0.02424	0.01522	0.03815
U	All Other Transportation	20	0.02891	0.01189	0.01634	0.02848	0.02328	0.02033	0.02619	0.02104	0.01627	0.02528
S	Communication	21	0.02177	0.01545	0.02083	0.02791	0.02478	0.03132	0.02319	0.01852	0.02194	0.02563
T	Electric and Gas Utilities	22	0.05408	0.03657	0.03301	0.04284	0.09764	0.05539	0.06025	0.04399	0.05076	0.05757
R	Water and Other Utilities	23	0.00805	0.00901	0.00763	0.00655	0.00670	0.00812	0.01021	0.00601	0.00556	0.00766
Y	Wholesale Trade	24	0.09887	0.06369	0.03443	0.05801	0.04652	0.06778	0.07631	0.08415	0.06696	0.10723
	Retail Trade	25	0.09642	0.07362	0.10180	0.15573	0.13550	0.20502	0.12632	0.09982	0.13010	0.14998
S	Finance, Insurance and Real Estate	26	0.21628	0.16765	0.12450	0.17833	0.15184	0.19096	0.13947	0.12452	0.14459	0.16282
E	Hotel Restaurant and Other Personal Services	27	0.03626	0.02724	0.04168	0.05614	0.05358	0.06476	0.05144	0.04149	0.05380	0.05991
L	Data Processing and Computer Services	28	0.00891	0.00635	0.00912	0.00964	0.01042	0.01200	0.01031	0.00813	0.00909	0.01071
L	Management and Consulting Services	29	0.00952	0.00695	0.01172	0.01326	0.01222	0.02247	0.01392	0.00964	0.01043	0.01295
I	Engineering and Related Services	30	0.00598	0.00439	0.00818	0.00548	0.01833	0.06743	0.01323	0.00460	0.00482	0.00591
N	Other Business Services	31	0.03982	0.02979	0.06852	0.06582	0.04983	0.06901	0.07059	0.05711	0.08311	0.05480
G	Automobile and Other Repair Services	32	0.03950	0.03229	0.04041	0.05268	0.03623	0.05493	0.04174	0.03505	0.03669	0.04610
	Amusements, Recreation and Video Services	33	0.01283	0.00967	0.01344	0.02008	0.01753	0.02262	0.01658	0.01314	0.01685	0.01914
	Health, Education and Social Services	34	0.02989	0.02271	0.03274	0.04680	0.04181	0.05293	0.03846	0.02984	0.03940	0.04548
	Government Services	35	0.00698	0.00532	0.00758	0.01116	0.00985	0.01273	0.00906	0.00702	0.00935	0.01069
	Local Government	36	0.03363	0.02380	0.03863	0.03704	0.04043	0.05426	0.03723	0.02931	0.03340	0.03640
	State Government	37	0.06528	0.04749	0.24127	0.06188	0.17317	0.09230	0.06346	0.05599	0.05466	0.06297
	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	0.42880	0.32890	0.42795	0.70529	0.59228	0.79223	0.56553	0.43651	0.58903	0.67384
	*** Column Sums ***		3.05562	2.10519	2.49195	2.87917	2.94485	3.25505	2.66614	2.51044	2.61883	2.92929

Table 15. Direct, Indirect, and Induced Coefficients, Input-Output Tables, US DOE, State of New Mexico, FY 1997 (continued).

			INDUSTRY PURCHASING									
			11	12	13	14	15	16	17	18	19	20
	Livestock and Livestock Products	1	0.00479	0.00439	0.00570	0.00500	0.00559	0.00556	0.00432	0.00546	0.00642	0.00619
	Other Agricultural Products	2	0.00563	0.00516	0.00674	0.00590	0.00659	0.00662	0.00510	0.00652	0.00749	0.00721
	Forestry and Fishery Products	3	0.00032	0.00038	0.00035	0.00029	0.00032	0.00032	0.00024	0.00037	0.00039	0.00035
	Agricultural, Forestry, and Fishery Services	4	0.00150	0.00151	0.00192	0.00154	0.00172	0.00227	0.00150	0.00149	0.00151	0.00142
	Mining, Crude Petroleum, and Natural Gas	5	0.02969	0.69847	0.13159	0.11934	0.03362	0.03554	0.02767	0.03541	0.07193	0.08599
	Construction	6	0.04118	0.07258	0.05122	0.04300	0.04707	0.05431	0.03561	0.04182	0.05305	0.04701
	Ordnance & Chemical Manufacturing	7	0.00279	0.01133	0.01055	0.00745	0.00312	0.00725	0.00313	0.00623	0.00298	0.00369
	Food and kindred Products	8	0.02019	0.01800	0.02420	0.02124	0.02378	0.02360	0.01851	0.02316	0.02711	0.02674
	Textile Products and Apparel	9	0.00345	0.00300	0.00413	0.00363	0.00409	0.00404	0.00382	0.00486	0.00463	0.00462
	Lumber and Wood Products	10	0.00233	0.00239	0.00312	0.00164	0.00163	0.00178	0.00131	0.00353	0.00181	0.00165
	Paper and Publishing	11	1.05138	0.00566	0.00911	0.00581	0.00691	0.00675	0.00618	0.00679	0.00790	0.00807
	Petroleum Refining and Products	12	0.02520	1.12545	0.04568	0.02849	0.02699	0.02700	0.02157	0.02928	0.08983	0.11505
	Glass, Stone and Clay Products	13	0.00290	0.00600	1.13192	0.00415	0.00346	0.00449	0.00658	0.00468	0.00393	0.00392
	Primary and Fabricated Metals	14	0.00463	0.00807	0.00817	1.13104	0.02131	0.02336	0.01784	0.02164	0.00506	0.00578
	Computer, Office and Service equipment	15	0.00752	0.00623	0.00893	0.00782	1.03105	0.00924	0.00816	0.00877	0.00994	0.00981
	Electrical Equipment	16	0.00549	0.00592	0.00646	0.01086	0.22357	1.15578	0.10107	0.01332	0.00775	0.00928
I	Scientific Instruments	17	0.00161	0.00124	0.00116	0.00108	0.00368	0.00108	1.01663	0.00484	0.00147	0.00126
N	All Other Manufacturing	18	0.00554	0.00538	0.00603	0.00582	0.00847	0.00667	0.00714	1.08805	0.00595	0.02049
D	Transportation and Warehousing	19	0.02316	0.01847	0.09210	0.02383	0.01372	0.01500	0.01338	0.02141	1.18190	0.01775
U	All Other Transportation	20	0.02129	0.05978	0.03990	0.02372	0.02224	0.02238	0.01711	0.02108	0.03950	1.09265
S	Communication	21	0.02873	0.02623	0.03261	0.02854	0.03264	0.03219	0.02655	0.03012	0.04610	0.04727
T	Electric and Gas Utilities	22	0.05361	0.17764	0.10082	0.06934	0.05978	0.06701	0.04871	0.05998	0.07195	0.06832
R	Water and Other Utilities	23	0.00707	0.00980	0.01024	0.00812	0.00834	0.00839	0.00624	0.00824	0.02395	0.01040
Y	Wholesale Trade	24	0.05716	0.07803	0.07906	0.08266	0.13167	0.08600	0.06405	0.08896	0.07671	0.07027
	Retail Trade	25	0.15720	0.13340	0.19009	0.16526	0.18600	0.18479	0.14357	0.18189	0.21502	0.20556
S	Finance, Insurance and Real Estate	26	0.17049	0.16079	0.20323	0.17836	0.20275	0.19957	0.15721	0.19167	0.24381	0.23354
E	Hotel Restaurant and Other Personal Services	27	0.06088	0.05490	0.07440	0.06542	0.07228	0.07160	0.05751	0.07036	0.08302	0.08571
L	Data Processing and Computer Services	28	0.01179	0.01299	0.01405	0.01180	0.01659	0.01578	0.01334	0.01361	0.01501	0.03288
L	Management and Consulting Services	29	0.01311	0.01448	0.01477	0.01302	0.01520	0.01541	0.02165	0.01528	0.01984	0.01844
I	Engineering and Related Services	30	0.00621	0.01733	0.00895	0.00839	0.00815	0.01147	0.00813	0.00763	0.00831	0.00817
N	Other Business Services	31	0.07185	0.05907	0.06501	0.06058	0.07291	0.07716	0.06622	0.06610	0.07444	0.08938
G	Automobile and Other Repair Services	32	0.04689	0.04571	0.06723	0.04840	0.05155	0.05865	0.04090	0.05320	0.11976	0.06043
	Amusements, Recreation and Video Services	33	0.02048	0.01757	0.02416	0.02119	0.02409	0.02386	0.01871	0.02326	0.02790	0.02721
	Health, Education and Social Services	34	0.04762	0.04129	0.05681	0.05002	0.05631	0.05651	0.04538	0.05539	0.06363	0.06158
	Government Services	35	0.01135	0.00974	0.01353	0.01187	0.01336	0.01326	0.01026	0.01302	0.01508	0.01457
	Local Government	36	0.04788	0.05174	0.04612	0.04136	0.04711	0.04661	0.03368	0.04356	0.04673	0.04885
	State Government	37	0.07972	0.14222	0.08629	0.07619	0.07748	0.07783	0.05460	0.07106	0.11322	0.08667
	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	0.70776	0.58469	0.85178	0.74687	0.84182	0.83566	0.64884	0.82298	0.94859	0.91919
	*** Column Sums ***		2.86041	3.69701	3.52813	3.13908	3.40696	3.29477	2.78238	3.16505	3.74360	3.55739

Table 15. Direct, Indirect, and Induced Coefficients, Input-Output Tables, US DOE, State of New Mexico, FY 1997 (continued).

			INDUSTRY PURCHASING								
			21	22	23	24	25	26	27	28	29	30
	Livestock and Livestock Products	1	0.00649	0.00370	0.00464	0.00587	0.00587	0.00569	0.01147	0.00596	0.00727	0.00638
	Other Agricultural Products	2	0.00768	0.00444	0.00558	0.00692	0.00696	0.00676	0.01374	0.00700	0.00759	0.00741
	Forestry and Fishery Products	3	0.00041	0.00031	0.00037	0.00038	0.00037	0.00047	0.00037	0.00036	0.00038	0.00039
	Agricultural, Forestry, and Fishery Services	4	0.00192	0.00126	0.00140	0.00182	0.00241	0.00311	0.00281	0.00185	0.00190	0.00160
	Mining, Crude Petroleum, and Natural Gas	5	0.03518	0.28311	0.05643	0.03556	0.03885	0.03093	0.03842	0.03162	0.03583	0.03348
	Construction	6	0.07957	0.12102	0.14315	0.04783	0.05382	0.07181	0.05643	0.04465	0.04962	0.04604
	Ordnance & Chemical Manufacturing	7	0.00253	0.00348	0.01250	0.00209	0.00195	0.00199	0.00248	0.00203	0.00467	0.00196
	Food and kindred Products	8	0.02720	0.01523	0.01936	0.02483	0.02472	0.02315	0.08070	0.02510	0.02677	0.02668
	Textile Products and Apparel	9	0.00477	0.00255	0.00329	0.00463	0.00422	0.00385	0.00427	0.00429	0.00452	0.00456
	Lumber and Wood Products	10	0.00253	0.00365	0.00771	0.00195	0.00183	0.00232	0.00189	0.00155	0.00172	0.00167
	Paper and Publishing	11	0.00843	0.00481	0.00606	0.01194	0.00981	0.00850	0.00836	0.01023	0.01041	0.00858
	Petroleum Refining and Products	12	0.03011	0.03499	0.05968	0.03203	0.03175	0.02620	0.02949	0.02746	0.03144	0.02873
	Glass, Stone and Clay Products	13	0.00511	0.00730	0.00964	0.00352	0.00374	0.00502	0.00499	0.00328	0.00657	0.00356
	Primary and Fabricated Metals	14	0.00527	0.00676	0.00655	0.00557	0.00433	0.00438	0.00424	0.00472	0.00605	0.00439
	Computer, Office and Service equipment	15	0.01031	0.00566	0.00706	0.00907	0.00912	0.00833	0.00851	0.01932	0.01017	0.01003
	Electrical Equipment	16	0.01987	0.00571	0.00873	0.01278	0.00718	0.00749	0.00668	0.05261	0.02543	0.00805
I	Scientific Instruments	17	0.00141	0.00134	0.01786	0.00119	0.00125	0.00135	0.00130	0.00148	0.00143	0.00135
N	All Other Manufacturing	18	0.00584	0.00388	0.00981	0.00584	0.00590	0.00535	0.00781	0.00513	0.00579	0.00533
D	Transportation and Warehousing	19	0.01271	0.01222	0.01750	0.01348	0.01299	0.01720	0.01816	0.01154	0.01693	0.01528
U	All Other Transportation	20	0.02070	0.03799	0.02157	0.02089	0.01948	0.02050	0.02350	0.02032	0.02406	0.01888
S	Communication	21	1.13206	0.02181	0.04578	0.04270	0.03832	0.03964	0.03467	0.04924	0.04325	0.03939
T	Electric and Gas Utilities	22	0.06210	1.12732	0.07841	0.06088	0.07602	0.05557	0.07969	0.05552	0.06178	0.05982
R	Water and Other Utilities	23	0.00966	0.00607	1.07124	0.00907	0.01083	0.01090	0.01517	0.00792	0.00893	0.00870
Y	Wholesale Trade	24	0.05119	0.03996	0.06314	1.06003	0.04352	0.04100	0.07183	0.06232	0.05295	0.04439
	Retail Trade	25	0.21002	0.11594	0.15807	0.19061	1.19443	0.17281	0.18064	0.19580	0.20291	0.20803
S	Finance, Insurance and Real Estate	26	0.23406	0.14516	0.17283	0.22457	0.27883	1.31816	0.24792	0.23015	0.24569	0.25049
E	Hotel Restaurant and Other Personal Services	27	0.07923	0.04706	0.05878	0.07236	0.07513	0.06840	1.08571	0.07422	0.08432	0.07831
L	Data Processing and Computer Services	28	0.02193	0.01418	0.01274	0.01978	0.01620	0.02350	0.01413	1.06054	0.03162	0.02369
L	Management and Consulting Services	29	0.01898	0.01237	0.01721	0.02396	0.01904	0.02845	0.02186	0.01848	1.05088	0.04960
I	Engineering and Related Services	30	0.02169	0.01775	0.01455	0.00812	0.00813	0.01248	0.00815	0.00775	0.03417	1.07617
N	Other Business Services	31	0.09616	0.06184	0.08842	0.09109	0.10250	0.09600	0.08233	0.08903	0.10747	0.19698
G	Automobile and Other Repair Services	32	0.06285	0.03275	0.04535	0.05790	0.05627	0.05472	0.05545	0.05781	0.05969	0.05392
	Amusements, Recreation and Video Services	33	0.11762	0.01509	0.02087	0.02569	0.02548	0.02340	0.02766	0.02660	0.02718	0.02716
	Health, Education and Social Services	34	0.06408	0.03566	0.04526	0.05798	0.05805	0.05397	0.05543	0.06068	0.06214	0.06420
	Government Services	35	0.01519	0.00837	0.01081	0.01361	0.01386	0.01266	0.01304	0.01417	0.01467	0.01509
	Local Government	36	0.06527	0.05021	0.05724	0.04647	0.05705	0.05442	0.05974	0.05586	0.06106	0.06089
	State Government	37	0.11315	0.10475	0.09783	0.11376	0.10169	0.18282	0.10512	0.09474	0.10434	0.10428
	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	0.94499	0.50327	0.66181	0.85089	0.86348	0.76828	0.80685	0.88683	0.91486	0.94224
	*** Column Sums ***		3.60825	2.91898	3.13923	3.21764	3.28538	3.27158	3.29100	3.32816	3.44645	3.53770

Table 15. Direct, Indirect, and Induced Coefficients, Input-Output Tables, US DOE, State of New Mexico, FY 1997 (continued).

			INDUSTRY PURCHASING									
			31	32	33	34	35	36	37	38	39	*Row Sums*
	Livestock and Livestock Products	1	0.00504	0.00401	0.00640	0.00794	0.00638	0.00947	0.01148	0.00627	0.01005	1.57340
	Other Agricultural Products	2	0.00588	0.00471	0.00814	0.00938	0.00768	0.01069	0.01267	0.00733	0.01172	1.77569
	Forestry and Fishery Products	3	0.00031	0.00027	0.00038	0.00045	0.00039	0.00114	0.00188	0.00035	0.00047	1.04484
	Agricultural, Forestry, and Fishery Services	4	0.00148	0.00143	0.00397	0.00307	0.00185	0.00276	0.00363	0.00153	0.00186	1.07272
	Mining, Crude Petroleum, and Natural Gas	5	0.02782	0.02931	0.03536	0.04233	0.23830	0.05312	0.04959	0.03879	0.04838	3.95501
	Construction	6	0.03770	0.03644	0.05621	0.06515	0.15505	0.13837	0.21502	0.05775	0.04900	3.43657
	Ordnance & Chemical Manufacturing	7	0.00164	0.00286	0.00359	0.00644	0.01989	0.00506	0.00368	0.00221	0.00251	1.23802
	Food and kindred Products	8	0.02110	0.01691	0.02643	0.03603	0.02691	0.03647	0.04016	0.02640	0.04273	2.07603
	Textile Products and Apparel	9	0.00368	0.00313	0.00414	0.00566	0.00467	0.00596	0.00622	0.00459	0.00749	1.22504
	Lumber and Wood Products	10	0.00137	0.00129	0.00204	0.00258	0.00467	0.00425	0.00640	0.00192	0.00167	1.23917
	Paper and Publishing	11	0.00977	0.00590	0.00782	0.01754	0.00702	0.02677	0.01299	0.00706	0.00886	1.36858
	Petroleum Refining and Products	12	0.02526	0.02830	0.02826	0.03640	0.13965	0.04607	0.04217	0.02969	0.04275	2.58269
	Glass, Stone and Clay Products	13	0.00291	0.00378	0.00387	0.00532	0.00913	0.00973	0.01444	0.00409	0.00376	1.37183
	Primary and Fabricated Metals	14	0.00365	0.00554	0.00423	0.00515	0.00932	0.02421	0.00943	0.00803	0.00416	1.44550
	Computer, Office and Service equipment	15	0.00806	0.00628	0.00835	0.01175	0.01028	0.01178	0.01084	0.01822	0.01649	1.36569
	Electrical Equipment	16	0.00867	0.01185	0.00697	0.00940	0.00834	0.01845	0.01320	0.01189	0.00881	1.85013
I	Scientific Instruments	17	0.00128	0.00139	0.00136	0.00540	0.00137	0.00764	0.00234	0.00158	0.00136	1.09972
N	All Other Manufacturing	18	0.00469	0.00886	0.00603	0.00835	0.00574	0.01392	0.00901	0.00484	0.00624	1.35368
D	Transportation and Warehousing	19	0.01094	0.01296	0.01211	0.01647	0.01948	0.02601	0.01642	0.01076	0.01416	1.94193
U	All Other Transportation	20	0.01667	0.01687	0.01818	0.02399	0.06807	0.03302	0.03760	0.01768	0.02212	2.05976
S	Communication	21	0.03653	0.02897	0.03601	0.04533	0.03564	0.06805	0.05660	0.03643	0.04505	2.43776
T	Electric and Gas Utilities	22	0.04669	0.04606	0.07015	0.07573	0.09765	0.08466	0.08424	0.06899	0.08319	3.68373
R	Water and Other Utilities	23	0.00690	0.00823	0.01039	0.01259	0.01077	0.01353	0.01587	0.00796	0.01162	1.43263
Y	Wholesale Trade	24	0.03896	0.05006	0.04847	0.06284	0.06348	0.06303	0.06513	0.07295	0.06383	3.57761
	Retail Trade	25	0.16410	0.13178	0.17681	0.24429	0.21702	0.24733	0.24795	0.25405	0.34806	7.89772
S	Finance, Insurance and Real Estate	26	0.20248	0.18719	0.24238	0.32331	0.22421	0.30728	0.30398	0.20652	0.30836	9.19596
E	Hotel Restaurant and Other Personal Services	27	0.06344	0.05639	0.06825	0.09657	0.07522	0.10708	0.09053	0.07290	0.11469	3.65093
L	Data Processing and Computer Services	28	0.01902	0.01127	0.01467	0.02134	0.02681	0.03136	0.02165	0.05003	0.01588	1.70285
L	Management and Consulting Services	29	0.02460	0.01811	0.02140	0.03229	0.01647	0.03705	0.02872	0.02931	0.01535	1.76843
I	Engineering and Related Services	30	0.00655	0.00601	0.00813	0.00987	0.01820	0.03198	0.02822	0.02959	0.00755	1.58615
N	Other Business Services	31	1.08760	0.06273	0.09563	0.10660	0.07199	0.08735	0.07914	0.09932	0.06726	4.06055
G	Automobile and Other Repair Services	32	0.04727	1.04703	0.05659	0.06826	0.05596	0.07044	0.06577	0.05163	0.07487	3.08288
	Amusements, Recreation and Video Services	33	0.02272	0.01716	1.09701	0.03288	0.02707	0.04008	0.03394	0.02718	0.04266	2.06775
	Health, Education and Social Services	34	0.05085	0.04004	0.05451	1.08548	0.06409	0.08869	0.08404	0.06997	0.10240	3.11212
	Government Services	35	0.01187	0.00925	0.01283	0.01759	1.01529	0.02545	0.01934	0.02649	0.02475	1.51013
	Local Government	36	0.05010	0.04799	0.05852	0.06774	0.04146	1.04499	0.04410	0.04681	0.04650	2.83419
	State Government	37	0.08576	0.08277	0.11817	0.12145	0.09213	0.08785	1.08610	0.08357	0.08519	4.74921
	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	0.73909	0.56759	0.79113	1.10082	0.97032	1.04372	1.02502	0.95339	1.59601	30.37914
	*** Column Sums ***		2.90244	2.62071	3.22493	3.84380	3.86797	3.96482	3.89954	3.44805	3.35781	

Table 16. Indirect Volume and Employment Impacts by Sub-sector, US DOE, State of New Mexico, FY 1997.

Sector	Volume ($000)	%	Employment Jobs	%
1. Livestock and Livestock Products	18413.	0.4	49.	0.1
2. Other Agricultural Products	21544.	0.5	120.	0.2
3. Forestry and Fishery Products	1033.	0.0	4.	0.0
4. Agricultural, Forestry, and Fishery Services	4487.	0.1	93.	0.2
5. Mining, Crude Petroleum, and Natural Gas	113985.	2.6	387.	0.7
6. Construction	169684.	3.9	1914.	3.6
7. Ordnance & Chemical Manufacturing	6487.	0.1	38.	0.1
8. Food and kindred Products	77577.	1.8	392.	0.7
9. Textile Products and Apparel	13475.	0.3	144.	0.3
10. Lumber and Wood Products	5628.	0.1	59.	0.1
11. Paper and Publishing	20743.	0.5	235.	0.4
12. Petroleum Refining and Products	87226.	2.0	58.	0.1
13. Glass, Stone and Clay Products	12023.	0.3	118.	0.2
14. Primary and Fabricated Metals	23606.	0.5	206.	0.4
15. Computer, Office and Service equipment	53537.	1.2	315.	0.6
16. Electrical Equipment	34931.	0.8	177.	0.3
17. Scientific Instruments	4635.	0.1	28.	0.1
18. All Other Manufacturing	14230.	0.3	151.	0.3
19. Transportation and Warehousing	31616.	0.7	430.	0.8
20. All Other Transportation	51935.	1.2	626.	1.2
21. Communication	107027.	2.4	912.	1.7
22. Electric and Gas Utilities	202714.	4.6	289.	0.5
23. Water and Other Utilities	23397.	0.5	109.	0.2
24. Wholesale Trade	214331.	4.9	2478.	4.7
25. Retail Trade	746463.	17.0	15164.	28.6
26. Finance, Insurance and Real Estate	606805.	13.8	4687.	8.8
27. Hotel Restaurant and Other Personal Services	214198.	4.9	6099.	11.5
28. Data Processing and Computer Services	146990.	3.3	1317.	2.5
29. Management and Consulting Services	86116.	2.0	533.	1.0
30. Engineering and Related Services	86938.	2.0	716.	1.3
31. Other Business Services	291824.	6.6	2871.	5.4
32. Automobile and Other Repair Services	151688.	3.5	1404.	2.6
33. Amusements, Recreation and Video Services	79848.	1.8	1667.	3.1
34. Health, Education and Social Services	205603.	4.7	3805.	7.2
TOTAL Private Sector	3930735.	89.5	47594.	89.7
35. Government Services	77844.	1.8	839.	1.6
36. Local Government	137538.	3.1	1812.	3.4
37. State Government	245556.	5.6	2841.	5.4
TOTAL Public Sector	460937.	10.5	5492.	10.3
TOTAL Private and Public Sectors	4391673.	100.0	53085.	100.0

Totals may not add due to rounding

Table 17. Indirect Volume and Employment Impacts by Sub-sector, US DOE, State of New Mexico, FY 1997.

Sector	Volume ($000)	Employment Jobs
1. Agriculture	45477.	266.2
2. Mining	113985.	387.2
3. Construction	169684.	1913.7
4. Manufacturing	354097.	1920.8
5. Transportation, Communication, Utilities	416689.	2365.4
6. Wholesale and Retail Trade	960794.	17641.5
7. Finance, Insurance, and Real Estate	606805.	4687.4
8. Other Services and Education	1263205.	18411.4
9. Local, State, and Other Government Services	460937.	5491.8
TOTAL	4391673.	53085.5
10. US Department of Energy	0.	0.0
11. Households	0.	0.0

Totals may not add due to rounding

Table 18. Income and Jobs Impact, US DOE, State of New Mexico, FY 1997.

	Income ($000)	Jobs
Direct Salaries and Wages	1190569.	19977.
Indirect Salaries and Wages	1147994.	47594.
Interests, Dividends, and Rents	384342.	n/a
Total Private Sector	2722904.	67571.
Total Public Sector	174791.	5492.
Transfer Payments --	(0.)	n/a
Net Impact	2897695.	73062.

Table 19. Type II Multipliers, US DOE, State of New Mexico, FY 1997.

	Economic Activity ($000)	Income ($000)	Jobs
Direct impacts	2938235.	1190569.	19977.
Indirect and induced impacts	7289368.	1707126.	53085.
Total impacts	10227603.	2897695.	73062.
Type II Multipliers	3.48	2.43	3.66