



Economic Benefits of Indian Point Energy Center

An Economic Impact
Study by the
Nuclear Energy Institute



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Executive Summary

The Indian Point Energy Center in Buchanan, N.Y., is an integral part of the local economy. The plant provides jobs and makes purchases that stimulate the local economy directly and indirectly. Among the tangible benefits that the plant provides to the area are jobs, taxes, economic output and labor income, together with contributions to the local community. And there are other intangible benefits to the region, such as clean air and low, stable electricity prices. Indian Point's economic impact reaches beyond the local community to the state and even the national level.

The total economic impact of the Indian Point plant on Westchester, Orange, Rockland, Putnam and Dutchess counties for 2002 was \$763.3 million. Indian Point's total impact on New York state's economy for the same period was \$811.7 million and \$1.5 billion for the U.S. economy. The plant's total economic impact includes direct effects, which comprise the value of plant output, as well as secondary effects resulting from plant operation.

In 2002, the Indian Point Energy Center employed 1,683 people (including Entergy Nuclear Northeast's headquarters in White Plains). Eighty percent live in the five-county area surrounding the plant, including an estimated 302 employees in Westchester County, 646 in Dutchess County and 249 in Orange County. In addition, these jobs pay salaries that are on par with the high average salaries of Westchester County and are on average 12 percent higher than salaries in Rockland and Putnam counties, and 45 percent higher than average salaries in Orange and Dutchess counties.

The economic activity generated by Indian Point creates another 1,200 jobs in the five-county region. Given the combination of employees at the plant and secondary jobs created by Indian Point's economic activity, the plant is responsible for 2,500 jobs in Westchester, Orange, Rockland, Putnam and Dutchess counties.

The main expenditure of the Indian Point plant in the local area is employee compensation. During the study period, Indian Point paid \$126.6 million in compensation to employees living in the five counties near the plant and an additional \$19.3 million to employees in New York state who reside outside these counties. Additionally, the economic activity created by the Indian Point plant accounted for \$44.8 million in employee compensation in the surrounding five counties and an additional \$65.2 million in other areas of the state. Together, the direct and indirect compensation from the plant accounts for \$171.4 million in labor income in the five counties and an additional \$39.7 million in other areas of New York state.

The Indian Point plant makes substantial purchases in the region. In 2002, the plant made \$287.7 million in purchases, including \$54.9 million in New York state and \$16.8 million in Westchester, Orange, Rockland, Putnam and Dutchess counties. Economic activity generated by the Indian Point plant also led to \$113.3 million in increased economic production in the five counties and \$48.4 million throughout the rest of New York state.

In 2002, the Indian Point plant paid \$25.3 million in taxes to entities within Westchester County. This represented approximately 87.6 percent of total tax revenues in the village of Buchanan and 93 percent of the total tax revenues of the Hendrick Hudson Central School District. Further, the economic activity generated by Indian Point contributed another \$24.4 million in state and local taxes, through increased income, property and sales taxes. By combining the direct and indirect taxes, the Indian Point plant accounts for \$49.7 million in state and local tax payments.

In addition to the direct economic benefits provided by Indian Point, the plant generated 15.7 billion kilowatt-hours (kWh) of electricity in 2002, approximately 11 percent of New York state's electricity needs. This low-cost electricity helped keep energy prices in New York state

affordable. A 2002 study, *Electricity System Impacts of Nuclear Shutdown Alternatives*, estimates that if Indian Point were shut down, wholesale electricity prices in the downstate New York area would increase between 13 percent and 25 percent. The report was prepared by General Electric Systems Energy Consulting and National Economic Research Associates.

Indian Point also plays a vital role in maintaining regional air quality. Estimates indicate that in the absence of Indian Point, the state's nitrous oxide emissions would be 19 percent higher and sulfur dioxide emissions would be 11 percent higher because fossil-fueled power plants would offset Indian Point's electricity production. Additionally, carbon dioxide emissions, which have been linked to global warming, would be 20 percent higher.

Indian Point also is an integral part of the community, with civic involvement that ranges from participating in numerous charitable organizations to investing in the area's infrastructure through major donations to government, hospitals and schools. Without Indian Point, many smaller charities and local organizations would suffer disproportionately, given their dependence on the company and plant employees for both volunteers and financial resources.

Section I: Introduction

This economic study, conducted by the Nuclear Energy Institute¹ (NEI), examines the economic, fiscal and community benefits—together with other benefits—provided by the Indian Point plant, which is owned by Entergy². Benefits analyzed include those to the five counties within the plant community: Westchester, Orange, Rockland, Putnam and Dutchess. Impacts throughout both New York state and the United States are also reviewed. The study draws on detailed data from the plant to assess these benefits.

Although this study focuses primarily on the benefits to the local community, state and national impacts also are calculated. These include direct impacts—such as people employed by the plant, plant expenditures within the community, and corporate tax payments—and indirect impacts, such as jobs created indirectly by plant expenditures in the local economy. The study also includes other benefits provided by the plant, such as reliable, low-cost electricity, the benefits of a clean-air source of electricity and other contributions to the local community.

Entergy and NEI cooperated in developing this study. Entergy provided data on Indian Point employment, operating expenditures and tax payments, as well as guidance on particular details specific to the local area and the plant. NEI coordinated the project and applied Impact Analysis for Planning (IMPLAN), a nationally recognized economic model to estimate the direct and indirect impacts of the plant on the local community. The methodology employed in this study was developed by RTI International, a nonprofit research organization in Research Triangle Park, N.C. This is the third such study that NEI has undertaken with a member company.

This report includes the following sections:

- Section 2 provides background on the Indian Point plant, including plant history, performance, cost, employment, taxes and local area details, such as total employment and earnings.
- Section 3 examines the economic and fiscal impacts of the plant on the local, state and national levels.
- Section 4 provides data on benefits not captured by the model.
- Section 5 outlines recent trends in the nuclear industry as a whole, especially in cost, performance and safety.
- The final section discusses the methodology used in the study, including the economic modeling software employed as part of this effort.

¹ The Nuclear Energy Institute is the nuclear energy industry's policy organization. Additional information about nuclear energy is available on NEI's Web site at <http://www.nei.org>.

² Entergy Nuclear Indian Point 2, LLC and Entergy Nuclear Indian Point 3, LLC are the respective owners of Indian Point 2 and Indian Point 3. Entergy Nuclear Operations Inc. is the operator of both units.

Section 2: The Indian Point Energy Center

This section provides background information on the Indian Point plant and the surrounding counties of Westchester, Orange, Putnam, Rockland and Dutchess, including a brief history of the plant, as well as information on its performance, employment and taxes. This section also includes local area details, such as total employment, earnings, local tax collections and regional electricity costs for the village of Buchanan, the five counties surrounding the plant and New York state.

2.1 History and Information

Indian Point Energy Center is on the east bank of the Hudson River, about 25 miles north of New York City. The plant lies within Buchanan, a village of more than 2,000 residents. Buchanan is in the town of Cortlandt, which is inhabited by about 29,000 people. Cortlandt is part of Westchester County, home to roughly 920,000.

Indian Point was built by Consolidated Edison Co., the New York City metropolitan area's primary utility. Indian Point 1, a 275-megawatt pressurized water reactor, began producing electricity in 1962.

Two more reactors were added at Indian Point in 1974 and 1976. Indian Point 1 was permanently shut down in 1974 because revised Nuclear Regulatory Commission requirements for upgrading the emergency core cooling system and the price of fuel oil for the oil-fired system heaters made continued operation no longer cost effective. The Unit 1 technology differed from reactors built in the 1970s, such as Indian Point 2 and 3. Unit 1 is currently in decommissioning and is being kept in long-term, safe storage until Units 2 and 3 cease to operate. At that time, the three reactors will be dismantled concurrently.

Today, all three of the Indian Point reactors are owned by Entergy, which bought Indian Point 3 from the New York Power Authority in 2000, and purchased Units 1 and 2 from Con Edison in 2001. Today, Entergy operates 10 reactors in six states.

Indian Point 2's license allows it to operate until 2013, while Indian Point 3 can continue to operate until 2015. Entergy has announced that it plans to submit license renewal applications for some of its Northeast plants starting in 2005.

Table 2-1. The Indian Point Energy Center at a Glance

Unit	Capacity (MW)	Commercial Operation Year	Year of License Expiration	Reactor Type
Unit 1	275	1962	In Decommissioning	PWR
Unit 2	984	1974	2013	PWR
Unit 3	994	1976	2015	PWR

PWR = pressurized water reactor; MW = megawatts

In 2000, Indian Point 3 had its best year of operations, with a capacity factor of 100 percent. Capacity factor measures the amount of electricity produced vs. the maximum amount achievable if the plant generates power around the clock. Indian Point 2 had its best year in 2001, with a capacity factor of 94 percent.

Indian Point benefits the people of Buchanan, the surrounding counties and New York state in several ways. It is a major source of inexpensive, reliable electricity for the state and the New York Power Pool (NYPP), and it provides hundreds of jobs and significant economic benefits to the cities and towns of the surrounding counties.

2.2 Generation

The Indian Point Energy Center generated 15.7 million megawatt-hours (MWh) in 2001 and 16 million MWh in 2002. This was roughly 11 percent of the electricity generated in the state of New York, enough for 1.5 million homes. Efficient electricity production at the plant was driven by a high capacity factor for each reactor. Indian Point 2's capacity factor averaged 92 percent in 2001 and 2002; Indian Point 3 averaged 96 percent for those two years.

These levels of performance have made Indian Point an integral part of the New York power system. Without the low-cost electricity provided by the Indian Point plant, power prices in the state would increase significantly, and electricity reliability would decrease substantially.

A study conducted by General Electric Power Systems Energy Consulting and National Economic Research Associates concluded that the reliability of the New York electric system would be degraded and power prices would increase, if Indian Point were to shut down. The study used a model called GE-MAPS, designed to estimate local reliability and cost.

The study found that a shutdown of the Indian Point plant would reduce the reserve margin on the New York electric system from 14.5 percent, already a low reserve level, to 8.4 percent. The New York State Reliability Council estimates that an 18 percent reserve requirement is necessary to ensure adequate electricity supply. Low reserve margins substantially increase the probability of periods of high prices, emergency operating procedures by system operators and power curtailments.

The study also found that a shutdown of the Indian Point plant would result in higher electricity prices for customers in New York. This effect would be the greatest for customers in the downstate region. On-peak wholesale electricity prices could increase between 13 percent and 25 percent, with prices for Con Edison customers increasing 20 percent. These price increases would lead to increased consumer expenditures on electricity of \$800 million to \$1 billion per year during the next three to four years. This increase in expenditures would put a drain on the economy, in addition to the economic loss associated with the plant's closure.

Table 2-2. New York Power Pool Generation (2001)

Generation Source	Generation Million MWh	Percentage of Generation
Natural Gas	42.27	30%
Other Nuclear	22.67	16%
Coal	22.60	16%
Hydro	20.02	14%
Indian Point	15.70	11%
Oil	15.84	11%
NYPP Total	139.10	100%

Source: Platts

2.3 Employment

In addition to providing reliable electricity to New York, Indian Point is also a major source of employment for the residents of Buchanan and the surrounding area. In 2002, the Indian Point plant and Entergy’s White Plains office employed 1,683 people, of which 1,355 reside within the five surrounding counties of Westchester, Orange, Putnam, Rockland and Dutchess. The plant employs 302 people from Westchester County, of which 22 reside in the village of Buchanan. Indian Point employees from Buchanan represent one of every 50 working people from the village. Of the four remaining counties, the plant employs 646 people from Dutchess County, 249 people from Orange County, 113 people from Putnam County, and 45 people from Rockland County.

Table 2-3. Employment by County

County	Indian Point/White Plains Office		City/County Total*	
	Employees	Average Earnings	Employed Work Force	Average Earnings
Westchester	302	\$95,783	432,600	\$100,776
Dutchess	646	\$93,691	130,793	\$64,805
Orange	249	\$94,764	151,744	\$63,175
Putnam	113	\$94,964	48,932	\$83,620
Rockland	45	\$90,644	135,262	\$84,456
Other Metro Area [†]	322	\$103,345	5,491,406	\$71,442

* Census 2000

[†] This area encompasses New York City, Northern New Jersey and Long Island, N.Y., part of the New York-New Jersey-Connecticut-Pennsylvania Consolidated Metropolitan Statistical Area as defined by the U.S. Census Bureau. This chart does not reflect employees who reside outside the five-county local area and Other Metro Area.

Jobs provided by the Indian Point plant also are typically higher paying than most jobs in the area. Employees at Indian Point earned on average about \$95,000 in 2002, including salary and overtime. This is almost 50 percent higher than the average salary in New York state, which is about \$64,000 a year. Plant employees residing in the village of Buchanan had average earnings of \$84,574, about 5 percent higher than average earnings in the village. Indian Point employees from four of the five counties surrounding the plant had higher average earnings than the average salaries in the counties in which they reside.

In addition to the jobs provided by Indian Point, the plant also spends a large amount of money in the local community. In the one-year period of this study, the Indian Point plant made \$11.1 million worth of purchases in Westchester County and an additional \$6 million in Dutchess, Orange, Putnam and Rockland counties.

Table 2-4. Top Ten Cities/Towns by Total Employees

City/Town	County	Indian Point/ White Plains Office		City/County Total*	
		Employees	Average Earnings	Employed Work Force	Average Earnings
Wappingers Falls	Dutchess	183	\$94,871	2,534	\$48,599
Poughkeepsie	Dutchess	109	\$93,784	20,105	\$63,440
Hopewell Junction	Dutchess	99	\$100,651	1,430	\$68,394
Fishkill	Dutchess	71	\$98,795	8,055	\$64,145
Beacon	Dutchess	69	\$79,123	6,089	\$53,593
Peekskill	Westchester	63	\$88,913	10,963	\$58,838
Newburgh	Orange	57	\$81,047	13,731	\$67,739
Cortlandt Manor	Westchester	36	\$95,875	19,052	\$94,147
Middletown	Orange	24	\$94,690	10,852	\$51,708
Buchanan	Westchester	22	\$84,574	1,112	\$80,473

* Census 2000

Table 2-5. Top Ten Cities/Towns by Percent of Employed Work Force

City/Town	County	Percentage of Employed Work Force	Indian Point/ White Plains Office		City/County Total*	
			Employees	Average Earnings	Employed Work Force	Average Earnings
Wappingers Falls	Dutchess	7%	183	\$94,871	2,534	\$48,599
Verplanck	Westchester	5%	16	\$82,607	308	\$54,551
Hopewell Junction	Dutchess	4%	99	\$100,651	2,610	\$68,394
Cold Spring	Putnam	2%	22	\$82,311	983	\$80,058
Buchanan	Westchester	2%	22	\$84,574	1,112	\$80,473
Beacon	Dutchess	1%	69	\$79,123	6,089	\$53,593
Brewster	Putnam	1%	14	\$101,028	1,263	\$53,740
Fishkill	Dutchess	1%	71	\$98,795	8,055	\$64,145
Peekskill	Westchester	1%	63	\$88,913	10,963	\$58,838
Walden	Orange	1%	16	\$98,581	2,876	\$52,825

* Census 2000

2.4 Plant and Local Area Taxes

Indian Point also makes substantial tax payments to local jurisdictions, in addition to benefits derived from employment and direct purchases. In 2002, Indian Point paid approximately \$25 million in local property tax payments. The largest taxes paid by Indian Point were to the local school district. The plant paid more than \$20 million in taxes to Hendrick Hudson Central School District, accounting for approximately 93 percent of tax payments to the district. The plant also paid \$2.7 million to the village of Buchanan, 88 percent of taxes paid to the village; and \$569,000 to the Verplanck Fire District, 31 percent of taxes paid to the district.

Table 2-6. Property Taxes Paid by Entergy for Indian Point

Location	Property Tax Paid by Entergy	Total Property Tax Collected*	Percent Paid by Entergy
Westchester County	\$1,963,000	\$351,138,011	0.6%
Town of Cortlandt	\$378,000	\$38,252,876	1%
Village of Buchanan	\$2,665,000	\$3,041,628	88%
Verplanck Fire District	\$175,000	\$569,288	31%
Hendrick Hudson Central Schools	\$20,154,000	\$21,667,759	93%
Total Taxes Paid	\$25,335,000	\$414,669,562	6%

* Source: Westchester County Tax Commissioner

2.5 Summary

The performance of the Indian Point plant mirrors the performance of the nuclear industry as a whole. Indian Point provides reliable electricity generation and keeps power prices affordable in downstate New York. The plant also offers well-paid employment to Westchester and surrounding counties and a large tax base to Westchester County and the local jurisdictions around the plant. However, these are only the direct economic benefits of the plant. As illustrated in the next section, the secondary effects on the local and regional economies are as large as the direct benefits.

Section 3: Economic and Fiscal Impacts

The economic and fiscal effects of Indian Point go well beyond employee benefits, purchases of goods and services, salaries, taxes, and wages. They also reflect the strong stimulus that Indian Point's large wage and salary payments provide to key measures of economic activity—the value of electricity production, employment and labor income—in the local and state economies.

Indian Point's spending lifts economic activity throughout the local and state economies, as well as tax payments related to economic activity. This multiplier effect is felt throughout the local and state economies—by the private sector in the form of increased sales and employment and by the public sector through increased tax revenues to support public services.

Estimates of these effects were developed by applying the IMPLAN model to expenditure data provided by Entergy, owner of the Indian Point plants. (For more information on IMPLAN, see Section 6.)

3.1 Plant Expenditures in Westchester, Rockland, Orange, Putnam and Dutchess Counties

Indian Point and White Plains office expenditures for products and services (including labor) in Westchester, Rockland, Putnam, Orange and Dutchess counties totaled \$143.4 million for 2002. Spending within the local area represents approximately 30 percent of Indian Point's total spending of \$448.8 million and approximately three-quarters of the \$200.8 million of spending in New York state.

The expenditure totals for the local area were provided by Entergy and are shown in Table 3-1. The 10 sectors receiving the largest amount of Entergy spending are listed in the table according to the amount spent in the local area. The categories are chosen from among 528 IMPLAN sectors and are listed largely according to the IMPLAN description for each. Total compensation, which includes benefits, salaries and wages, is listed separately.

Similar expenditure totals for New York state and the United States are presented in Tables 3-2 and 3-3, respectively. Expenditure totals for the local area are included in the totals for New York state in Table 3-2, and for the United States in Table 3-3.

By far, the largest expenditures made by Entergy in the local area were for labor. Total compensation for labor services was \$126.6 million—approximately 90 percent of Entergy's expenditures in the study area. This reflects the fact that most of Indian Point's expenditures for labor services (wages, salaries and employee benefits) are made locally. Naturally, this share for the five counties surrounding Indian Point is much larger than that of New York state and the United States.

Building services represented the largest non-labor expenditures in the local area at \$3.7 million. This sector includes all of the maintenance activities performed at the plant by outside contractors. Most of these services relate to the maintenance of plant facilities, such as janitorial services, landscaping, pest control and plumbing. Although these are non-labor expenses, the activities are typically labor intensive and thus mainly represent personnel costs and local jobs.

The next largest non-labor expenditures in the local area were for water supply and sewerage. This sector includes the payments to local utilities for the use of water by the plant. Payments for water supply represented \$1.8 million in expenditures during the study period.

Most local expenditures in Table 3-1 were for services. The prevalence of the service sectors reflects the outsourcing of jobs by the plant in the local area. Seven of the top-10 plant expenditure categories are for services.

Table 3-1. Entergy Expenditures in Westchester, Putnam, Orange, Rockland and Dutchess Counties (2002)

Description	Amount
Services to Buildings	\$3,671,485
Water Supply and Sewerage Systems	\$1,891,035
Business Services	\$1,397,407
Equipment Rental and Leasing	\$1,247,140
Communications Equipment	\$953,571
Management and Consulting Services	\$700,440
Electrical Equipment	\$582,643
Maintenance and Repair of Facilities	\$562,843
Computer and Data Processing Services	\$494,230
Hotels and Lodging Places	\$430,813
Other	\$4,900,312
Subtotal	\$16,831,919
Total Compensation ^a	\$126,582,858
TOTAL	\$143,414,778

^a Total compensation includes wages, salaries and fringe benefits based on data provided by Indian Point. Employees at Entergy Nuclear Northeast's White Plains office are also included.

3.2 Plant Expenditures in New York

In 2002, Entergy expenditures for products and services (including labor) in New York state totaled \$200.8 million. This total includes \$143.4 million spent in the local area and \$57.4 million spent in other New York counties. Spending within the state represents approximately 45 percent of Entergy's total spending of \$448 million.

Entergy's total spending in New York state is presented in Table 3-2. Total compensation is the largest category at \$145.9 million and represents about 70 percent of the total. This is slightly lower than the share of total compensation for spending in the local area, indicating relatively more spending on products and services in other New York counties, compared to the five-county region surrounding the plant.

The largest non-labor expenditure was for state and local electric utilities. This expenditure represents payments for electric services from the New York Independent System Operator. These are largely services relating to the transmission of Indian Point's electricity onto the electricity grid and the plant's usage of electricity.

The next largest category—motors and generators—represents the purchase of components and services related to maintaining the plant's electric power generators. Entergy spent \$8.8 million on this category.

Building services remains an important category in the state. Building services was the third-highest category in the New York top-10 list. Service industries continue to make up a large portion of the expenditures in the state.

Table 3-2. Entergy Expenditures in New York State (2002)

Description	Amount
State and Local Electric Utilities	\$12,717,135
Motors and Generators	\$8,849,534
Services to Buildings	\$4,276,761
Management and Consulting Services	\$3,657,723
Other Business Services	\$2,794,127
Communications Equipment-NEC ^a	\$2,698,937
Water Supply and Sewerage Systems	\$2,086,842
Computer and Data Processing Services	\$1,500,439
Equipment Rental and Leasing	\$1,375,224
Electrical Equipment-NEC	\$1,060,884
Other	\$13,888,903
Subtotal	\$54,906,510
Total Compensation ^b	\$145,933,436
TOTAL	\$200,839,946

^a NEC = Not Elsewhere Classified

^b Total compensation includes wages, salaries and fringe benefits based on data provided by Indian Point. Employees at Entergy Nuclear Northeast's White Plains office are also included.

3.3 Plant Expenditures in the United States

In 2002, Entergy expenditures for products and services (including labor) purchased in the United States totaled \$357.1 million. Apart from expenditures of \$159.4 million in New York state, \$197.7 million was spent elsewhere in the United States. Much of that amount was for specialized products and services unique to the nuclear industry.

U.S. expenditures are detailed in Table 3-3. Total compensation (\$161.2 million) is the largest category, representing about one-third of the total. Total compensation as a share of the U.S. total

is much lower because plant employees live mostly in New York state (and particularly in the local area), whereas spending on products and non-labor services is concentrated outside the state.

The largest spending for products and non-labor services was for maintenance and repair of facilities (\$57.5 million). This result is not unique to Indian Point, since specialized maintenance and repair spending is typically the largest component of expenditures at other nuclear plants, reflecting the strong emphasis on these activities to maintain plants properly and ensure high availability rates and capacity factors.

The second largest non-labor spending category was management and consulting services. As is typical in the nuclear industry, Indian Point relies on highly specialized contractors and consultants to analyze the plant and its operations to ensure consistent performance. The third largest sector—uranium, radium and vanadium ores—represents fuel expenses for the plant. Indian Point’s fuel is purchased outside New York state. At the national level, services are an important part of Entergy’s expenditures. Six of the top 10 expenditures made nationally are for services.

Table 3-3. Indian Point Expenditures in the United States (2002)

Description	Amount
Maintenance and Repair of Other Facilities	\$57,532,646
Management and Consulting Services	\$35,390,076
Uranium-Radium-Vanadium Ores	\$30,224,443
Engineering-Architectural Services	\$15,951,100
State and Local Electric Utilities	\$12,720,334
Federal Government Enterprises	\$10,606,775
Computer and Data Processing Services	\$10,380,878
Motors and Generators	\$10,159,757
Services to Buildings	\$9,666,271
Insurance Agents and Brokers	\$8,894,087
Other	\$86,169,119
Subtotal	\$287,695,487
Total Compensation ^a	\$161,202,683
TOTAL	\$448,898,170

^a Total compensation includes wages, salaries and fringe benefits based on data provided by Indian Point and includes employees at Entergy Nuclear Northeast’s White Plains office.

3.4 Taxes Paid and Accrued

A summary of taxes paid by Entergy on behalf of Indian Point in 2002 is presented in Table 3-4. Corporate income taxes were not included in the data because those taxes are paid at the corporate level and not explicitly by the Indian Point plant.

Local taxes in this table refer to the towns and districts in the study area. Property taxes paid in the local area (\$25.3 million) represent almost 70 percent of the taxes paid by the plant. These include payments to local school districts and fire districts. Property taxes are paid to Westchester County, the town of Cortlandt, the village of Buchanan, the Hendrick Hudson Central School District and the Verplank Fire District. By far, the largest payments are made to the Hendrick Hudson School District, which accounts for approximately 80 percent of the property tax payments.

In addition to property taxes, Indian Point also paid payroll taxes to the state and federal governments totaling nearly \$10 million. The plant also contributes to the profits of Entergy, which pays state and federal corporate income taxes. However, these taxes are not quantified in this study.

Table 3-4. Taxes Paid by Indian Point (2002)

Federal Payroll Tax ^a	\$9,794,398
State and Local Taxes	\$25,479,732
Property Tax	\$25,335,000
Payroll Tax ^a	\$144,732
Total Taxes Paid	\$35,274,130 ^b

^a The division of payroll taxes between federal and state is based on the average distribution from IMPLAN data.

^b Excludes federal income taxes paid by Indian Point.

Table 3-5. Impact of Indian Point Energy Center on Local, State and National Economies

	Direct	Indirect^a	Induced^b	Total
Local Area				
Output	\$650,000,000	\$26,523,396	\$86,764,515	\$763,287,899
Labor Income	\$126,583,000	\$10,913,021	\$33,942,648	\$171,438,669
Employment	1,355	280	918	2,553
New York State				
Output	\$650,000,000	\$54,621,790	\$107,125,921	\$811,747,691
Labor Income	\$145,933,008	\$22,632,196	\$42,535,089	\$211,100,309
Employment	1,559	488	1,132	3,179
United States				
Output	\$650,000,000	\$382,945,230	\$491,311,999	\$1,524,257,225
Labor Income	\$161,202,704	\$175,593,811	\$173,867,555	\$510,664,071
Employment	1,683	4,190	5,125	10,998

^a Indirect impacts measure the effects on input suppliers of expenditures by Indian Point.

^b Induced impacts measure the effects produced by the change in household income that results from Indian Point expenditures.

3.5 Economic Impacts by Geographic Area

Summary economic impacts for each of the three geographic areas—the local area, New York state and the United States—are presented in Table 3-5. The three economic impact variables are:

- output—the value of production of goods and services, measured in 2002 dollars
- labor income—the earnings of labor, measured in 2002 dollars
- employment—measured in jobs provided.

These economic impacts are divided into their direct and secondary effects. The direct effects reflect the industry sector and geographical distribution of Entergy spending without any subsequent spending effects. The secondary, or “ripple,” effects include subsequent spending effects, which can be further divided into indirect and induced. Indirect effects reflect how Indian Point spending patterns alter subsequent spending patterns among suppliers. Induced effects reflect how changes in labor income influence the final demand for goods and services, which then has an impact on all sectors producing basic, intermediate and final goods and services.

The direct effects are based on the estimated value of Indian Point revenues of \$650 million for 2002. Revenues were estimated using generation figures from Indian Point and the average price of power from Entergy’s nuclear reactors in the Northeast. The average price of power was obtained from Entergy’s annual report.

These revenues, which are spent, distributed, invested or paid as taxes, reflect the total output of products and services associated directly with Indian Point and the White Plains office. This total includes the expenditures for products and services (including labor) itemized in Tables 3-1, 3-2 and 3-3.

Nationwide, the direct employment (1,683 jobs) is the average Indian Point employment level over this period. Eighty-one percent of these jobs are filled by workers residing in the local area. Of the remaining 328 jobs, 204 are filled by residents of New York state outside the local area, and the remainder are filled by residents of other states. As Table 3-5 indicates, direct effects are typically the largest contributor to total effects for each of the measures of economic impact and for local area and New York. State ripple effects are the largest contributor to total effects in the United States.

Induced effects are larger than indirect effects for the state and local economies, because there is more spending on labor income, which causes induced effects, than on goods and services, which causes indirect effects. Indirect effects are more important as a share of the total at the national level.

A helpful way of measuring the ripple effects is by using multipliers. Multipliers show the ratio of the plant's "total economic impact" to its "direct economic impact" and can be measured for each geographic region. Multipliers essentially measure how many dollars are created in the economy for every dollar spent by the plant.

In terms of output, Indian Point's direct impact for the local area is \$650 million, while its total impact is \$763.3 million (*see Table 3-5*). Thus, the multiplier for Indian Point's output for the local area is 1.17. This indicates that for every dollar of output from the Indian Point plant, the local area economy produces \$1.17. Using the same formula, the output multiplier is 1.25 for the state and 2.35 for the United States. This means for every dollar of Indian Point output, the state economy produces \$1.25 and the U.S. economy produces \$2.35.

Table 3-6. Indian Point's Impact on the Most Affected Industries in Westchester, Rockland, Orange, Putnam and Dutchess Counties

Industry Description	Output	Labor Income	Employment
Electric Services	\$650,931,840	\$126,764,472	1,357
Owner-Occupied Dwellings	\$9,180,758	-	0
Wholesale Trade	\$5,997,007	\$2,528,002	39
Doctors and Dentists	\$5,638,043	\$3,317,516	57
Services to Buildings	\$4,704,194	\$1,969,959	99
Real Estate	\$4,536,372	\$615,432	19
Hospitals	\$4,324,430	\$2,614,840	61
Banking	\$4,087,369	\$789,038	16
Eating and Drinking	\$3,367,526	\$1,366,463	79
Insurance Carriers	\$3,083,332	\$1,117,537	17
Other	\$67,437,028	\$30,355,410	809
TOTAL	\$763,287,899	\$171,438,669	2,553

3.6 Economic Impacts by Local Industry

Indian Point impacts virtually every sector of the economy. The direct effects are concentrated in a few sectors, but the ripple effects—especially the induced effects—increase the dispersion of total effects across other sectors. The largest ripple effects in the local region are in service industries used by plant employees. The sectors most affected vary by geographic area. Table 3-6 presents the 10 sectors most affected by the plant in the local area, based on total output.

The sector most affected in terms of total output is the electric services sector because this includes electricity produced by the plant. Thus, all direct effects are included in this sector. It is the largest sector based on total output in the New York and U.S. economies, as shown in Tables 3-7 and 3-8, respectively.

The most affected sectors based on total output are not always the most affected sectors based on other impact measures (i.e., labor income and employment). A striking example of this is the second most affected sector, the real-estate values sector, also known as the owner-occupied dwellings sector.

This is not a traditional business-industry sector, and thus there are no impacts on labor income or employment. Instead, it is a special sector developed by the U.S. Department of Commerce's Bureau of Economic Analysis that estimates what homeowners would pay in rent if they rented rather than owned their homes. In essence, it creates an industry based on home ownership.

The sole product (or output) of this industry is home ownership, purchased entirely by personal consumption expenditures out of household income. In effect, this sector captures increases in

housing values due to increased labor resulting from the plant. Rental costs are included in the real estate category in Table 3-6.

The owner-occupied dwellings sector is influenced by the large number of employees at the plant. These employees require housing and this additional demand leads to increased output from the housing sector. This affect also leads indirectly to increased local tax revenues, since increases in housing raise local property tax revenues.

The third most affected sector is wholesale trade, which represents the intermediate buying and selling of goods purchased by the plant and its employees. This section is large because purchased goods are typically distributed through a wholesaler, so this category is involved in most of the expenditures by Entergy, its employees and its suppliers.

As Table 3-6 indicates, many of the most affected local industries are related to services required by the plant’s workers, such as doctors and dentists, real estate, hospitals, banking, and restaurants, in addition to the owner-occupied dwellings category. Further, building services, a large direct expenditure of the plant, remains an important component of the plant’s local impacts.

Overall, the IMPLAN model estimates that 1,196 people are employed in the local area as a result of spending by Entergy and its employees.

Table 3-7. Impact of Indian Point Energy Center on the Most Affected Industries In New York

Industry Description	Output	Labor Income	Employment
Electric Services	\$650,115,648	\$145,958,992	1,559
Owner-Occupied Dwellings	\$10,401,062	\$0	0
Wholesale Trade	\$8,240,323	\$3,467,725	58
Management and Consulting Services	\$7,861,060	\$4,310,168	69
Real Estate	\$6,062,534	\$822,511	25
Hospitals	\$5,925,414	\$3,687,267	77
Doctors and Dentists	\$5,819,619	\$3,397,659	61
Eating and Drinking	\$5,401,403	\$2,204,015	125
Banking	\$5,225,686	\$1,008,842	11
Services to Buildings	\$4,854,570	\$2,213,714	83
Other	\$101,840,372	\$44,029,416	1,111
TOTAL	\$811,747,691	\$211,100,309	3,179

3.7 Economic Impacts by State Industry

Table 3-7 uses the same sectors as Table 3-6 to illustrate effects of the plant on New York state. Again, electric services and owner-occupied dwellings are the most affected sectors in terms of total output.

The entries in Table 3-7 for the most affected industries in New York are similar to those in the five counties surrounding the plant. The primary exception is the inclusion of management and consulting services among the top-10 sectors affected in the state. These services, which are highly specialized, tend to have offices located outside the study area or outside the state.

As with local impacts, the most affected state categories are primarily related to purchases by plant employees for services. Many of these services, such as restaurants, doctors and dentists, and real estate, are owned and operated by local small business owners.

The IMPLAN model estimates that 1,620 jobs (in addition to those at the plant) are created in the state of New York as a result of Indian Point. In other words, for every person employed at the Indian Point plant, another person is employed in the state.

Table 3-8. Impact of Indian Point Energy Center on the Most Affected U.S. Industries

Industry Description	Output	Labor Income	Employment
Electric Services	\$650,026,176	\$161,209,200	1,683
Management and Consulting Services	\$73,699,360	\$36,913,264	772
Maintenance and Repair Other Facilities	\$43,311,992	\$27,672,752	646
Owner-Occupied Dwellings	\$38,156,280	\$0	0
Wholesale Trade	\$32,882,724	\$13,798,861	259
Real Estate	\$32,344,150	\$4,384,204	169
Computer and Data Processing Services	\$30,098,628	\$22,451,376	257
Banking	\$25,652,060	\$4,952,178	102
Engineering-Architectural Services	\$24,950,872	\$11,228,860	247
Communications-Except Radio and TV	\$22,292,954	\$5,518,133	69
Other	\$550,842,029	\$222,535,243	6,793
TOTAL	\$1,524,257,225	\$510,664,071	10,998

3.8 Economic Impacts by U.S. Industry

Table 3-8 illustrates the plant’s economic impact on the United States. Electric services, maintenance and management and consulting services are the most affected sectors in terms of total output nationwide.

The 10 most affected sectors (on the basis of output) in the United States are similar to the 10 most affected sectors in the local area and in New York state. The main difference is the appearance of specialized engineering and computer services. These services are often highly specialized to the nuclear industry and are performed by a limited number of firms in the country. Consequently, the services are typically purchased from out-of-state contractors.

3.9 Tax Impacts

Energy spending has effects on tax payments that extend beyond the taxes paid directly on the plant. This spending has direct impacts on income and value creation, which in turn affects taxes paid on that income and value. Similarly, the ripple effects of Indian Point spending on other spending and economic activity leads to additional income and value creation, which leads to additional taxes paid. These additional or “induced” effects on tax payments, presented in Table 3-9, are much larger than the taxes paid directly.

Given its expenditures and tax payments, Indian Point is responsible for an estimated \$49.6 million in state and local tax expenditures. Most of these tax impacts result from local property taxes paid by the plant and induced by its spending, and state income taxes paid by its employees. Additionally, the plant and its indirect and induced effects account for an estimated \$165.9 million in federal tax revenue.

These results can be used to compute tax multipliers, but not for each line item. Line-item tax multipliers cannot be computed because some taxes are not paid by Entergy. Table 3-9 does not include taxes accrued by Indian Point.

Table 3-9. Tax Impacts of Economic Activity Induced by Indian Point

	Total Tax Impact^a
Federal Government	\$165,885,884
Payroll Tax	\$56,174,168
Personal Taxes	\$55,963,509
Corporate/Business Taxes	\$53,748,207
State and Local Government	\$49,696,707
Payroll Tax	\$327,951
Personal Taxes	\$11,063,126
Corporate/Business Taxes	\$38,305,630
Total Taxes	\$215,582,591

^a The total tax impact includes taxes directly paid by Indian Point and the taxes paid by other entities as a result of the economic activity created by Indian Point expenditures.

3.10 Summary

The Indian Point Energy Center has substantial economic and fiscal impacts locally and in New York. When compared with their respective economies, the relative impacts of Indian Point are highest for the local area and next highest for New York state. The plant's job-creation impact (direct and indirect) of 2,553 is a significant number of jobs deriving from a single establishment. These impacts are greater in absolute terms at the national level than at the state level, and similarly are greater at the state level than at the county level.

As is the case with other nuclear plants, Indian Point buys specialized products and services from national and international markets. The state and local economic and fiscal effects are great, in large part because of the buying power created by Indian Point's high wages, salaries and benefits, which are spent on goods and services provided locally and in nearby areas.

Section 4: Additional Benefits Provided by Indian Point

Since buying the Indian Point Energy Center in 2001, Entergy has continued the plant's long-standing tradition of playing an integral role in the community. This involvement ranges from participating in numerous charitable organizations to investing in community infrastructure through major donations to governments, hospitals and schools. Without Entergy and its employees, many smaller charities and local organizations would suffer disproportionately, because of their dependence on the site for both volunteers and financial resources. In addition, Entergy provides direct financial aid, equipment and training to local jurisdictions, counties and the state for emergency planning purposes.

4.1 Introduction

Indian Point and Entergy have a long tradition of community involvement. Company leaders support volunteerism and promote the sharing of financial and intellectual talent in the local area. Civic involvement is an integral part of Entergy's corporate mission, which the company views as an investment in its communities.

Entergy's community investments take many forms, such as grants to community organizations, employee gift matches and volunteerism. Because local problems are best solved through local solutions, Entergy relies on employees who are part of the community and are knowledgeable about their area's unique needs. These employees serve on local contributions committees that make funding decisions.

The mission of the Indian Point local contributions committee is to participate in community events, support local schools and charities, and encourage volunteerism among employees and their families. In addition, the Indian Point local contributions committee helps identify community problems and mobilizes site resources to help solve them.

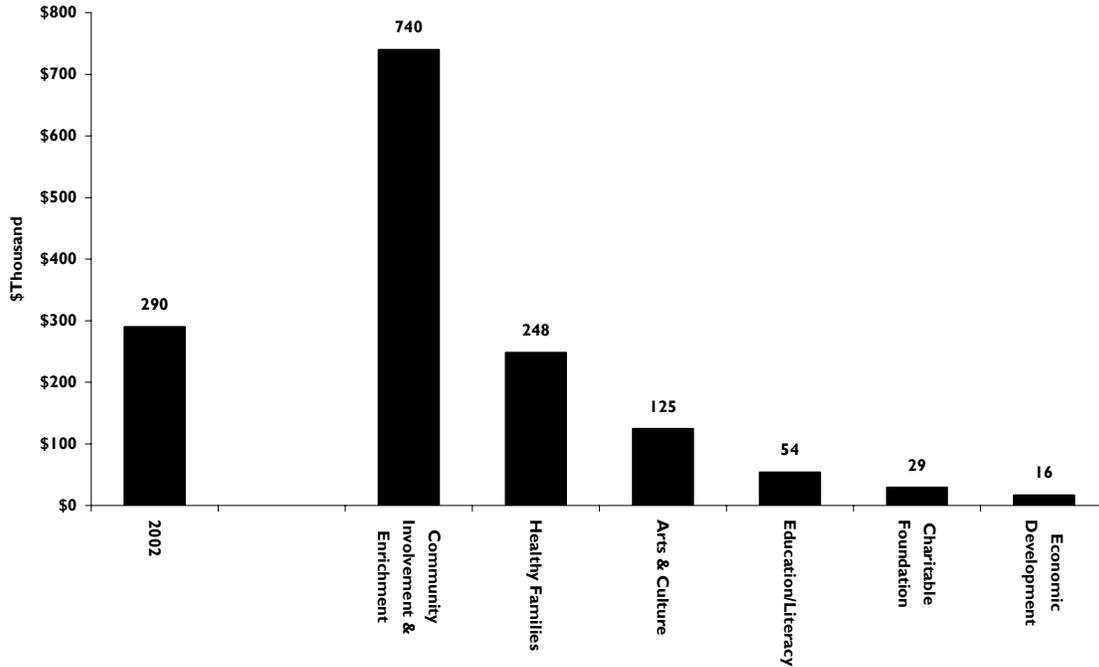
The committee has approved contributions to such groups as the Brooklyn Children's Museum, Orange County Amateur Radio Club, Haldane Central School District, Careers for People With Disabilities, the Blue Mountain Middle School and town of Fishkill Volunteer Cadet Program. Hillcrest School, African American Men of Westchester, Association for Pupil Transportation, McQuade Children's Services, Westchester Youth Dance Ensemble and the American Cancer Society have also received support from the committee.

Entergy's corporate giving programs include a variety of open, community partnership, employee matching and environmental stewardship grants. The Entergy Charitable Foundation is a private foundation dedicated to building stronger communities through a special focus on low-income initiatives, as well as educational and literacy programs.

In 2002, Entergy and the Entergy Charitable Foundation on a national basis funded more than 3,000 grant requests totaling approximately \$10 million in cash contributions. In New York state, Indian Point and Entergy donated \$290,000 in 2002 and \$1.2 million in 2003. The beneficiaries included educational institutions, social services agencies, charitable organizations, and environmental, civic and governmental organizations. Among the groups receiving donations were the Juvenile Diabetes Research Foundation, the Alzheimer's Disease and Related Disorder Association of Central New York, Hendrick Hudson Free Library and the Research Foundation on Behalf of the State University of New York. Other recipients included Apropos Housing Opportunities and Management, Hudson Valley Hospital Center, American Red Cross,

Westchester Arts Council and the city of White Plains, N.Y., Public Safety Division. Entergy's donations provide valuable benefits to the residents of southeastern New York.

Figure 4-1.
2003 Contributions by Entergy to Local Organizations by Program



Description of Contributions:

Open Grants

Entergy Open Grants focus on improving communities as a whole through the support of health and social service agencies, the arts and culture, and community improvement/enrichment programs. Typical grant awards range from \$500 to \$5,000.

Community Partnership Grants

Entergy partners with community leaders to identify and support local nonprofit organizations that are working to build stronger, more productive communities. Entergy's Community Partnership grants assist churches, schools and other nonprofit groups in their grassroots efforts to improve or support education and literacy, community enrichment, healthy families, arts, and cultural activities. The maximum award is \$1,000.

Entergy Charitable Foundation

The Entergy Charitable Foundation supports programs that provide innovative and measurable ways to positively affect low-income families and help them break the cycle of poverty. Typical grants range from \$2,500 to \$5,000.

United Way Campaigns

In 2002, Entergy matched employee gifts to the United Way campaign dollar-for-dollar. Entergy's employee, retiree and corporate gifts to the United Way in 2002 totaled almost \$4 million. Indian Point and White Plains employees contributed \$35,000 to local United Way agencies, with a \$55,000 corporate match.

Matching Educational Gifts

Education is the key to the future—both for individuals and for society as a whole. That's why Entergy provides dollar-for-dollar matches to employee, board member and retiree contributions to high schools, colleges and universities.

Community Connectors Grants

When the needs are great and resources scarce, volunteerism is essential to help fill the gap. Entergy's Community Connectors program is designed to celebrate and honor its employees' commitment to volunteerism. Through Community Connectors, Entergy employees log and redeem their volunteer hours for grants to the nonprofit organization of their choice. An individual can earn up to \$250, and a team can earn \$500 per year.

Community Power Scholarships

With the cost of higher education skyrocketing, Entergy established the Community Power Scholarship program for children of employees. Although academic performance is a consideration, the scholarship program is unique because it focuses on the applicant's community involvement. In 2003, a total of 20 scholarships, for \$5,000 each, were awarded.

Power of America Scholarships

In the aftermath of Sept. 11, 2001, Entergy helped lead an industrywide effort to provide scholarships for the children of the victims. Entergy contributed \$500,000 as seed money to start the fund, which currently stands at more than \$3.1 million. In 2003, 35 scholarships, for \$1,000 each, were awarded.

4.2 Social Services

Entergy is one of the largest charitable contributors in the region. The company's charitable efforts include offering multiyear grants to Hudson Valley Hospital to substantially increase the facility's emergency room and emergency preparedness capabilities, as well as providing significant funding for the Westchester Arts Council. Entergy contributions helped the Westchester County Chapter of the American Red Cross launch the Emergency Planning and Preparedness Academy for training first-responders in the region. Entergy is a recognizable force in charitable giving.

In 2003, Entergy copied its successful fuel fund program from its southern region and initiated the Heartshare Energy Assistance Program in the Northeast—an employee-sponsored subsidy that supports elderly or disabled persons in their efforts to pay the ever-increasing cost of cooling and heating their homes.

4.3 Education

Public education is an important part of Indian Point's commitment to the communities surrounding the site. One of the most successful programs in the plant's history has been the Energy Institute—a two-week continuing education seminar for local high school teachers run by the State University of New York at Oswego. This annual, multidimensional course covers a wide range of energy options and issues beyond just learning about nuclear energy. Teachers learn new techniques for instructing students on the latest alternative forms of energy by using hands-on experimentation and exploring the subject through the use of active debate.

Started as a sponsorship under the prior ownership of Indian Point 3, the Energy Institute has grown into a partnership of equals under Entergy's direction. This interactive learning experience presents attendees with a comprehensive overview of energy issues, including (but not limited to) nuclear power. Although Entergy takes a hands-off approach to the development of course content by the college, the company takes an active role in providing nuclear engineers, who present the science of nuclear energy in an informative and relaxed forum.

Many Indian Point employees also use their knowledge of nuclear engineering, occupational safety and radiation as invited speakers at various educational forums.

4.4 Environmental Protection

In addition to the economic benefits that Indian Point provides to the local area, the plant also plays a vital role in preserving air quality in New York, particularly the Hudson Valley and New York City. Nuclear power does not produce any air pollution in the process of generating electricity. If Indian Point no longer operated, its electricity production would need to be replaced by existing fossil-fired power plants in the region, which would increase the region's air pollution.

A 2002 study by TRC Environmental Corp. found that if Indian Point were closed, the state's carbon dioxide emissions would increase by 20 percent. Carbon dioxide has been identified by many scientists as a contributor to global climate change. The study also estimates that without Indian Point, nitrous oxide emissions would be 19 percent higher in the state. Nitrous oxide has been linked to respiratory illness and is a precursor to ozone depletion and acid rain.

Westchester County is designated as a non-attainment area for ozone by the U.S. Environmental Protection Agency. Without the Indian Point plant, Westchester County would have severe difficulty meeting its ozone goals. Ozone has been linked to lung illness and leads to smog and reduced visibility.

In the absence of Indian Point, sulfur dioxide levels would be 11 percent higher in New York state. Sulfur dioxide is a precursor to acid rain and has been linked to respiratory illness.

The study also estimates that in the absence of Indian Point, carbon monoxide levels would be 42 percent higher, particulate matter emissions would be 28 percent greater, and emissions of volatile organic compounds would be 35 percent higher. These emissions have similar health and environmental impacts as nitrogen oxide and sulfur dioxide.

4.5 Civic/Government

Indian Point employees represent a cross-section of civic participation and volunteer positions within government agencies, law enforcement, emergency medical services, hazardous material squads and fire departments. Following the Sept. 11 attacks, Indian Point personnel were called upon to assist regional fire, police and emergency services departments in responding to the event. Some employees went immediately to join fellow volunteers in assisting with rescue efforts, others helped with coordination of relief plans. When breathing apparatus for rescue workers ran out, emergency workers turned to Indian Point, because the site had one of the largest inventories of breathing equipment in the region. In addition to the loan of equipment, several Indian Point workers provided training on the equipment to rescue workers, who were using assisted breathing gear for the first time.

Local Celebrations

Besides charitable contributions, Entergy is a supporter of two premier local celebrations. The New York Power Authority has a longstanding tradition of supporting Peekskill Celebration, and when Entergy purchased Indian Point 3 from the authority in 2000, the company continued as a major sponsor of this important event. The company also supports the highlight of the multi-day event—the Saturday night fireworks show. Additionally, Entergy provides volunteers to help guide the development and execution of the celebration.

Likewise, Harborfest is the crowning jewel of Oswego County’s yearlong community event calendar. As one of the largest employers in the county, Entergy provides financial and volunteer resources to event coordinators when planning this celebration. Hundreds of local businesses depend on this multi-day event for revenue, and Entergy is proud to assist those businesses through its sponsorship of Harborfest.

Section 5: Nuclear Industry Trends

U.S. nuclear power plant performance reached an all-time high in 2002, the fifth consecutive record-setting year. The nuclear energy industry has steadily improved performance and cost, while also improving plant safety. The nuclear energy industry is a model of industrial safety. Power plant performance is commonly measured by capacity factor, which expresses the amount of electricity actually produced by a plant, compared with the maximum achievable. U.S. nuclear power plants achieved a capacity factor of 91.9 percent in 2002. Total electricity production for U.S. nuclear power plants reached new heights in 2002. At the same time, production costs for those plants have been among the lowest of any baseload fuel source.

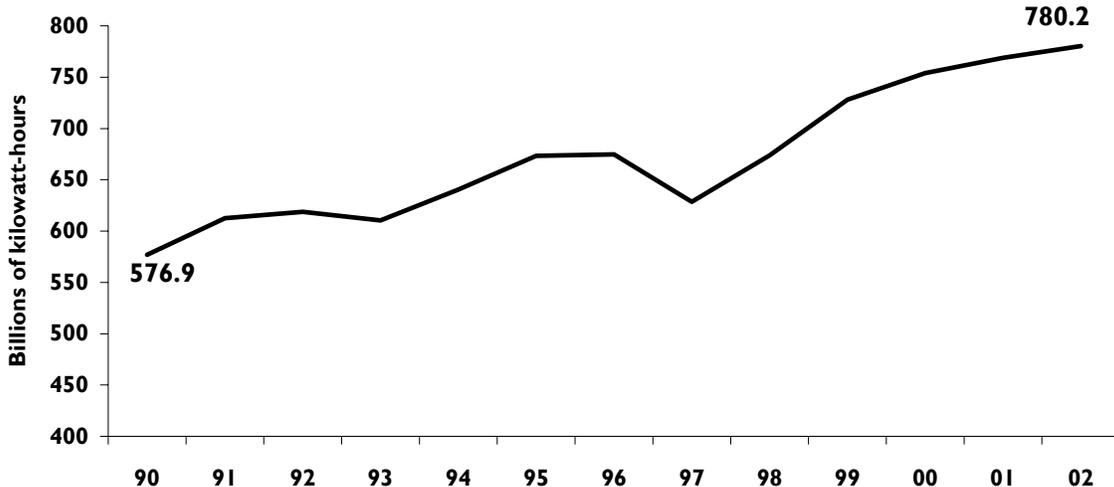
5.1 Nuclear Industry Performance

U.S. nuclear power plants have increased their output and improved their performance significantly over the past 10 years. Nuclear energy represents about 20 percent of all electricity generated in the United States. In 2002, nuclear power generated 780 billion kilowatt-hours (kWh) of electricity. Since 1990, the industry has increased total output equivalent to 26 new, large nuclear plants. The increase in output has been achieved without building any new plants.

In 2002, U.S. nuclear plants operated at an average capacity factor of 91.9 percent. Overall capacity factors for U.S. nuclear power plants increased dramatically over the past decade. By contrast, the average industry capacity factor was 60 percent in the late 1980s.

One of the key reasons for these increased capacity factors has been the shortening of refueling outage times.

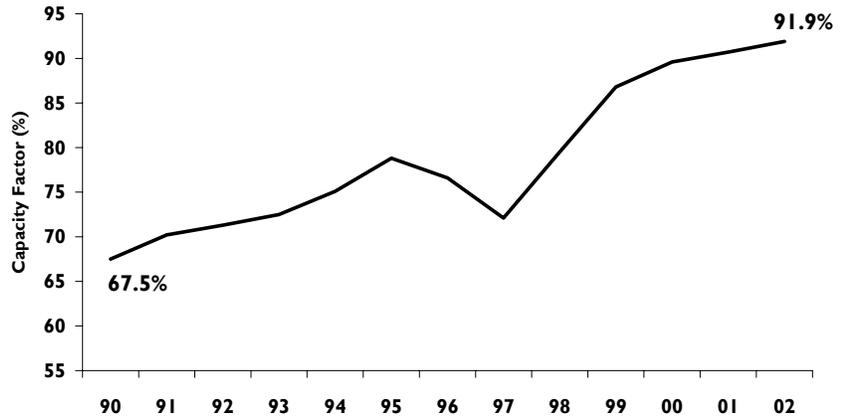
Figure 5-1. U.S. Nuclear Industry Net Electricity Generation
(35% increase from 1990 to 2002)



Source: Energy Information Administration

Nuclear plants need to shut down to refuel approximately every 18 to 24 months. Refueling represents one of the major determinants of nuclear plant availability. In the past 10 years, the durations of refueling outages have been declining. In 1990, the average refueling outage took 105 days to complete. By 2001, this number declined to an average of 37 days, and companies continue to apply best practices to reduce this average length of refueling. The record for the shortest refueling outage is 14.67 days for boiling water reactors and 15.63 days for pressurized water reactors.

Figure 5-2. Nuclear Industry Average Capacity Factors (1990-2002)

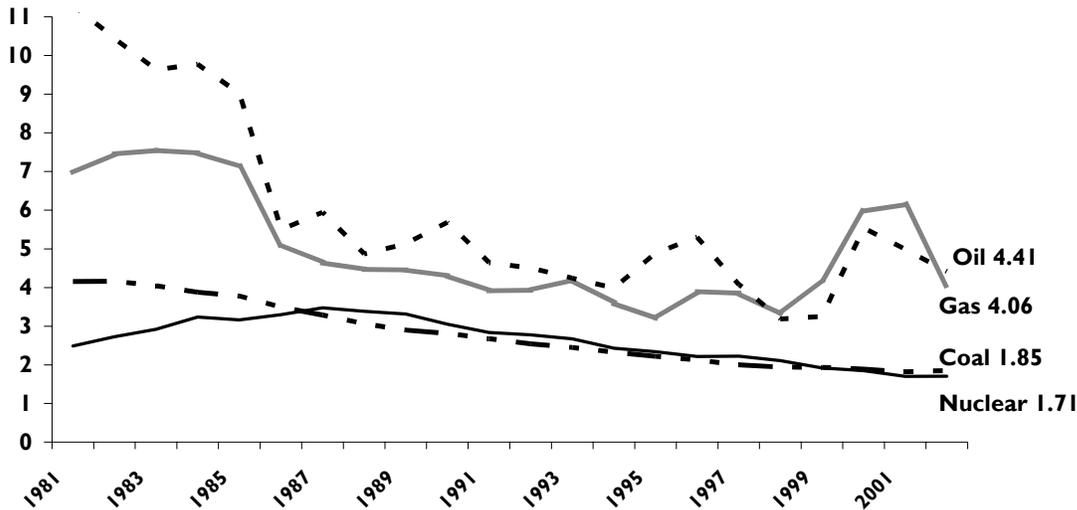


Source: Energy Information Administration

5.2 Cost Competitiveness

Along with increasing output, the U.S. nuclear industry has continued to decrease the cost of producing electricity. In 2002, nuclear power had a production cost of 1.71 cents/kWh, significantly lower than the production costs of electricity generated by oil and natural gas and slightly lower than coal. In the past decade, nuclear power production costs have dropped by about one-third, as a result of the increased efficiency of U.S. plants. Since most of a nuclear plant's costs are fixed, greater electricity production creates lower cost. However, nuclear plants have also taken steps to reduce their total costs through improved work processes.

Figure 5-3. U.S. Electricity Production Costs (1981-2002 in constant 2002 cents/kWh)



Source: Pre-1995: Utility Data Institute (UDI), Post-1995: Resource Data International (RDI) Modeled Production Cost

Table 5-1. Regional Wholesale Electricity Prices (cents/kWh)

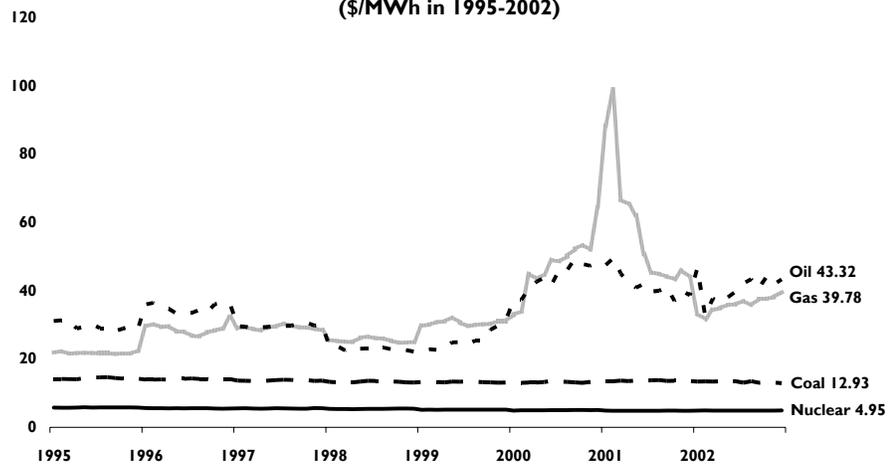
Region	2001 Average On-Peak Prices	2003 On-Peak Futures Prices
New England	4.99	3.58
New York	4.97	4.38
Mid-Atlantic	3.93	3.63
Tennessee Valley	3.58	3.03
Gulf States	3.60	3.05
Midwest	3.39	3.00
Texas	3.46	3.30
Northwest	13.00	3.48
Southwest	11.30	3.73

Source: Megawatt Daily

Because of low production costs and excellent safety performance, today’s nuclear plants are very competitive in today’s energy markets. Ultimately, the primary test of nuclear energy’s competitiveness is how well it performs against market prices. In this respect, nuclear energy is highly competitive. Average production costs at 103 reactors were 1.71 cents/kWh in 2002, lower than the average price of electricity in all regional markets. Nuclear power is also competitive with futures market prices, one of the best ways to judge what prices will be in the year ahead.

Nuclear plants also provide a unique degree of price stability for two reasons. First, production costs for nuclear plants are comprised of costs not associated with fuel. Many fuel markets tend to be volatile, so the production costs of generation sources tied to fuel expenses are highly volatile, as they swing with variations in fuel markets. Fuel represents only 20 percent of the production cost of nuclear power, but it makes up between 60 percent and 80 percent of the cost of natural gas, coal and petroleum-fired electricity. Second, nuclear fuel prices are much more stable than that of natural gas and petroleum. Because of its stable, low production cost, nuclear power can help mitigate large electricity price swings.

Figure 5-4. Monthly Fuel Cost to Electric Generators
(\$/MWh in 1995-2002)



Source: Resource Data International (RDI) and Utility Data Institute (UDI).

5.3 Industry Safety

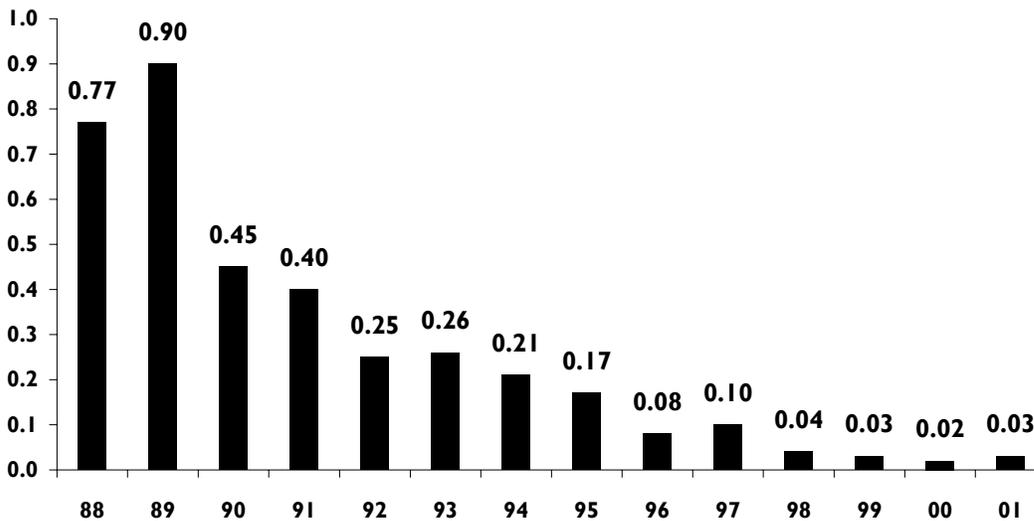
The nuclear industry’s recent performance and cost achievements have been accomplished in an era of outstanding safety at U.S. nuclear plants. In 2002, the nuclear power industry met or exceeded all safety goals set by the Institute of Nuclear Power Operations (INPO) and the World Association of Nuclear Operators (WANO). These entities track safety and performance data in 10 key areas.

One key indicator tracked by INPO and WANO is the number of unplanned automatic plant shutdowns. The U.S. industry has made dramatic improvements in the number of unplanned automatic shutdowns, dropping from 7.3 shutdowns per reactor in 1980 to a median of zero per reactor since 1997.

Other safety and performance indicators tracked by the Nuclear Regulatory Commission confirm the excellent safety performance of U.S. nuclear plants. The NRC tracks data on the number of “significant events” at each nuclear plant. (A significant event is broadly defined as any occurrence that challenges a plant’s safety system.) The average number of significant events per reactor has declined from 0.77 per year in 1988 to 0.03 in 2001.

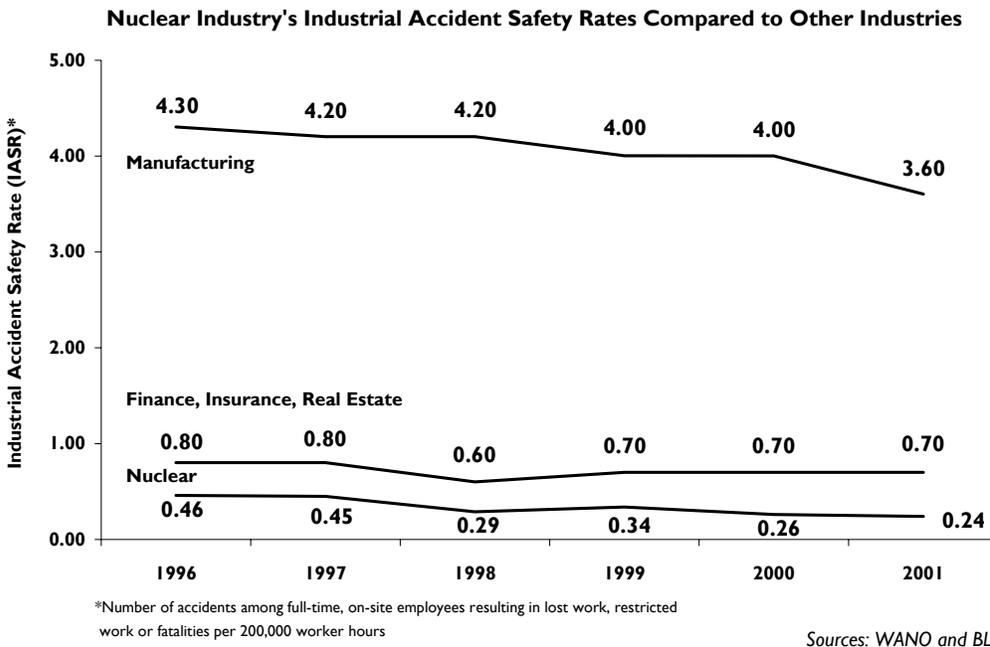
In addition to safe operations, U.S. nuclear plants continue to improve the already high levels of worker safety. According to NRC data, radiation exposure to workers (measured in rem) decreased from an average of about 1 rem per year in 1973 to 0.16 rem per year in 2001. Both the historical and current doses per employee are far below the regulatory limit of 5 rem per year.

Figure 5-5. Significant Events: Annual Industry Average
(Number of events per reactor 1988-2001)



Source: Nuclear Utility Service

Figure 5-6. Nuclear's Safety Record



General worker safety also is excellent at U.S. nuclear power plants—far safer than the U.S. manufacturing sector. WANO and the Bureau of Labor Statistics provide information on the industrial accident safety rate. This statistic measures the lost workday accidents or fatalities per 200,000 worker hours. The nuclear industry has improved its industrial accident safety rate from 0.46 in 1996 to 0.24 in 2001. By comparison, the U.S. manufacturing industry had an industrial accident safety rate of 3.6 in 2001 and the U.S. finance, insurance and real estate industries had an industrial accident safety rate of 0.7—both trailing the nuclear industry.

5.4 Current Industry Events

The excellent economic and safety performance of U.S. nuclear plants has increased interest in nuclear power by the electric utility industry, the financial community and policymakers. This is evidenced by the increasing number of plants seeking license renewals from the NRC.

Nuclear plants were originally licensed to operate for 40 years, but can safely operate for longer periods of time. The NRC granted the first 20-year license renewal to two reactors at the Calvert Cliffs plant in Maryland in 2000. As of January 2004, 23 reactors have received license extensions, and 17 reactors have submitted an application for a license extension. License renewal is an attractive alternative to building new electric capacity because of nuclear power's low production costs and the return on investment for renewal.

Besides relicensing current plants, interest has recently increased in building new nuclear plants. Several companies are exploring building new plants, including three companies—Entergy, Dominion Energy and Exelon—that have submitted applications with the NRC to test the agency's new permitting process for new reactor sites. In addition, President Bush included construction of new nuclear plants as an essential part of the administration's National Energy Strategy announced in May 2001.

Section 6: Economic Impact Analysis Methodology

The methodology used to estimate the economic and fiscal impacts of the Indian Point power plant is commonly referred to as input/output methodology. Several operational input/output models are available in the marketplace—the market leaders are Impact Analysis for Planning (IMPLAN), REMI and RIMS-II. The IMPLAN model was selected for use in this study, primarily because the model and many of the data sets were already on hand, the relevance of IMPLAN to the particular application, as well as its transparency and ease of use.

This report section presents typical applications of input/output methodology and explains the methodology and its underpinnings. It also describes how Indian Point data and the IMPLAN model were used to estimate local, state and national economic and fiscal impacts of plant operation.

6.1 Use of Input/Output Models

Input/output models capture input—or demand—and output—or supply—interrelationships for detailed business, government and industry sectors in a geographic region. They also capture the consumption of goods and services for final demand by these sectors and by the household sector. The basic geographic region is a county, and model results can be developed at the county, multi-county, state, multi-state and national levels. They are particularly useful in examining the total effects of an economic activity or of a change in the level of that activity.

These models are typically used when the following key questions need to be addressed:

- How much spending does an economic activity (such as a power plant) bring to a region or local area?
- How much of this spending results in sales growth by local businesses?
- How much income is generated for local businesses and households?
- How many jobs does this activity support?
- How much tax revenue is generated by this activity?

These models are also useful in addressing related questions, such as the geographic and industry distribution of economic and fiscal impacts. Typical applications of these models include facility or military base openings and closings, transport or other public infrastructure investments, industrial recruitment and relocation, and tourism.

6.2 Overview of the Input/Output Methodology

Input/output models link various sectors of the economy—agriculture, construction, government, households, manufacturing, services and trade—through their respective spending flows in a reference year. These linkages include geographic linkages, primarily at national, state and county levels.

As a result of these linkages, the impact of an economic activity in any sector or geographic area on other sectors and areas can be modeled. These impacts can extend well beyond the sector and area in which the original economic activity is located. They include not only the direct, or initial, effects of the economic activity, but also the subsequent, or “ripple,” effects that flow from this activity. Direct effects are analogous to the initial “splash” made by the economic activity,

and ripple effects are analogous to the subsequent “waves” of economic activity (employment, new income, production and spending) that are triggered by this splash. A full accounting of the splash’s effect also must include the waves emanating from the splash itself.

The sum of the direct and ripple effects is called the total effect, and the ratio of the total effect to the direct effect is called the “total effect multiplier,” or simply the multiplier effect. Multipliers can be developed for any of the model outputs, such as earned income, employment, industry output and total income (which includes the effect of transfers between institutions).

Multipliers can also be developed for any industry or business sector or geographic area in the model. Multipliers for a county are smaller than for a larger area (the state in which the county is located) because some of the spending associated with an economic activity “leaks” from the small area into the larger area. At the local area level, multipliers are larger if the local area economy is more diversified and if the economic activity being modeled is a good “fit” within that economic base.

Ripple effects include two components—indirect and induced effects—that are separately modeled within input/output models. Indirect, or “upstream,” effects are the effects on the supply chain that feeds into the business-industry sector in which the economic activity is located. For example, when Indian Point buys a hammer for \$5, it contributes directly to the economy by this purchase, but the company that makes the hammer also has to increase its purchases of steel and wood to maintain its inventory, and this will increase output in the steel and wood industries. The steel and wood industries will then have to purchase more inputs for their production processes, and so on. The result will be an economic impact that is greater than the \$5 initially spent by Indian Point for the hammer.

Induced effects are the impacts on all sectors that result from changes in final demand of commodities and services that are associated with changes in income from the economic activity. They are primarily associated with changes in household spending on goods and services for final demand. These are the result of changes in labor income.

To illustrate, when Indian Point pays \$5 for a hammer, a portion of the \$5 goes to pay the wages of employees at the company that makes the hammer. This portion contributes to labor income, which provides an additional contribution to the economy through its effects on household spending for goods and services. There also will be a contribution from the effect of this purchase on labor income in the wood and steel industries, and on the resulting household spending for goods and services. Indian Point’s own wage and salary expenditures create induced effects as well, and they occur primarily in the local area economy.

As with any model, input/output models incorporate some simplifying assumptions to make them tractable. There are several key simplifying assumptions in input/output models.

Input/output models assume a fixed commodity input structure. In essence, the “recipe” for producing a product or service is fixed, and there is no substitution of inputs, either new inputs (which weren’t in the mix before) for old inputs, or among inputs within the mix. Input substitution does not occur if technical improvements in some inputs make them relatively more productive. Nor does substitution occur if there are relative price changes among inputs. Were any of these types of substitutions allowed, they might dampen the multiplier effects, especially for larger geographic areas.

Another key simplifying assumption is constant returns to scale. A doubling of commodity or service output requires a doubling of inputs, and a halving of commodity or service output requires a halving of inputs. There is no opportunity for input use relative to commodity or service production levels to change, as those levels expand or contract, so there are no opportunities for either economies or diseconomies of scale. This will not dramatically alter the overall results as long as the economic activity whose effects are being modeled isn't large relative to the rest of the sectors.

In other words, the models assume that for every dollar of output, the same dollar amounts are required for the various input categories. Returning to the hammer example, if a \$5 hammer requires \$3 of steel, then two hammers would require \$6 of steel. Although that works for steel and hammers, some inputs do not vary directly with output. For instance, if an oil refinery's efficiency and output increases, a corresponding increase in personnel operating the plant is unlikely. The return to scale assumption, which takes such differences into account, is necessary for modeling.

Input/output models assume no input supply or commodity/service production capability constraints. This simplifying assumption is related in part to the constant returns to scale assumption, for if there were supply constraints, there likely would be diseconomies of scale. As in the case of the constant returns to scale assumption, this "no supply constraints" assumption is not a major concern as long as the economic activity of interest isn't large relative to the rest of the sectors.

To illustrate, the no-supply-constraints assumption assumes that a hammer manufacturer would purchase all the steel for the same price. If not, doubling the number of hammers sold could mean that the dollar value of the steel might more than double if the manufacturer had to buy more steel at a higher price. This would violate the constant returns to scale assumption, which simplifies modeling.

Homogeneity is also a key simplifying assumption. Basically, firms within sectors and technologies within sectors are characterized as very similar. There is some ability to edit sector files to characterize specialized firms, but there is no ability to reflect full diversity of firms within sectors.

6.3 The IMPLAN Model and Its Application to Indian Point

IMPLAN was originally developed by the U.S. Department of Agriculture's Forest Service in cooperation with the Federal Emergency Management Agency and the U.S. Department of the Interior's Bureau of Land Management to assist in land and resource management planning. IMPLAN, which has been used since 1979, is supported by the Minnesota IMPLAN Group Inc.

There are two components of the IMPLAN system: the software and the database. The software performs the necessary calculations, using study area data, to create the models. It also provides an interface for the user to change the region's economic description, create impact scenarios and introduce changes into the local model. The software is described in a user's guide provided by the Minnesota IMPLAN Group.

The software was designed to serve three functions: data retrieval, data reduction and model development, and impact analyses.

The IMPLAN database consists of two major parts: national-level technology matrices and estimates of regional data for institutional demand and transfers, value added, industry output and employment for each county in the United States, as well as state and national totals.

The model's data and account structure closely follow the accounting conventions used in the input/output studies of the U.S. economy by the Department of Commerce's Bureau of Economic Analysis. The comprehensive and detailed data coverage of the entire United States by county and the ability to incorporate user-supplied data at each stage of the model-building process provide a high degree of flexibility, both in terms of geographic coverage and model formulation.

In applying the IMPLAN model to Indian Point, three basic types of data were provided by Entergy: purchase order expenditures by Indian Point purchase order code, employee compensation expenditures and tax payment data.

Purchase order expenditures were provided for 2002 by Entergy. Employee compensation (salary data and an estimate of the value of benefits) was provided for the same period. Tax payment data were provided for 2002. For each of these data types, the location of the expenditure was identified.

The purchase order data were mapped to IMPLAN's 528 codes by comparing the descriptions of the purchase orders with the Standard Industrial Classification codes used in IMPLAN sector codes.

The purchase order and compensation data were then augmented by an estimate of revenues from Indian Point sales into the wholesale market over this period. This augmentation was necessary because purchase orders and compensation do not reflect all Indian Point expenditures, and total expenditures (approximated by total revenues) better reflect the full economic impacts of Indian Point. This estimate was obtained from reported data by Entergy.

In tailoring the model to Indian Point, the underlying data sets provided by IMPLAN were reviewed to see if any IMPLAN coefficient could be edited to better reflect local conditions. These coefficients are based on national relationships, and in some cases may not reflect local conditions. In this report, the coefficients within the electric services sector were edited to more accurately reflect a nuclear power plant rather than a "national average power plant of all types." This constituted the majority of the coefficient editing.

IMPLAN was then used to develop the economic and impact estimates contained in this report.



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