

"I would have to say it has had a positive effect on the tourism draw." The director of recreation in Grover City stated that PG&E is very supportive of recreational groups. Arroyo Grande has a standard of approximately 1.6 ha (4 acres) per 1000 residents and would like to keep that standard even if continued growth occurs.

C.4.3.4.2 Predicted Impacts of License Renewal

Based on the estimated 2273 direct workers required during peak refurbishment, the staff estimates that 864 direct workers and 68 indirect workers will migrate with their families to San Luis Obispo County (Section C.4.3.1.2). The number of children accompanying these workers is estimated using the California average family size (3.32) and assuming that all families include two adults. Children are expected to be evenly distributed in age from ≤ 1 to 18 years. Assuming 72.2 percent of these children are school age (5 to 18 years), there will be an average of 0.95 school-age children per in-migrating family, or a total of 885 new students in San Luis Obispo County. This represents a 0.1 percent increase above the projected number of school-age children in San Luis Obispo County in 2015 (assuming the 1990 age distribution of the population). This slight increase will result in only small impacts to education.

During the construction phase, improvements were made to several roads leading to the plant. An additional increase of 2273 direct workers and 3631 new residents during refurbishment should have a small impact on traffic flow on a road system currently accommodating over 200,000 residents. Likewise, refurbishment-related population increases should have little or no impact on other public services, such as

social services, public safety, tourism, and recreation.

A water supply shortage has plagued all of southern California in the recent past. In San Luis Obispo County sufficient processing capacity exists, but severely limited water availability has resulted in water-use restrictions and has contributed to the enactment of growth control measures. The water supply shortage began after the construction and early operations phase of Diablo Canyon; therefore, the effect of a plant-related increase in population is unknown. An increase in water demand resulting from an additional 3600 persons might, however, result in moderate impacts to public water availability. Absent this water supply shortage, only small impacts to public utilities will result.

Based on past operations information, impacts of license renewal term operations to most public services are likely to be small. The projected operations-related population increase is small (200 persons) and will result in extremely small increase in demand for public services. The public water supply, however, may be moderately affected during refueling activities in the license renewal term if the water supply shortage continues.

C.4.3.5 Off-Site Land Use

This section describes the off-site land-use impacts of the construction, operation, and license renewal of the Diablo Canyon Nuclear Generating Station. The discussion of impacts is primarily concerned with land use in the immediate vicinity of the plant, but impacts for the remainder of San Luis Obispo County are described where appropriate. Land-use impacts are examined for two time periods. First, Section C.4.3.5.1 identifies the land-use impacts of Diablo Canyon's construction and operation. Next,

Section C.4.3.5.2 projects the land-use impacts of Diablo Canyon's refurbishment period based on the impacts that occurred during the plant's construction. Also, Section C.4.3.5.2 projects the land-use impacts of the plant's license renewal term based on the impacts that have occurred during operations. Information sources for this report include the *Final Environmental Statement Related to the Nuclear Generating Station Diablo Canyon, Units 1 and 2* (AEC Dockets 50-275 and 50-323); *Socioeconomic Impacts of Nuclear Generating Stations: Diablo Canyon Case Study* (NUREG/CR-2749, vol. 5); and interviews with key information sources in San Luis Obispo County. Section C.4.1.5 describes the methods used to assess and project land-use impacts for all case study plants.

C.4.3.5.1 Impacts from Plant Construction and Operation

Diablo Canyon was constructed on a 300-ha (750-acre) site on the California coast. In 1968, when plant construction began, the area in the immediate vicinity of the site was very remote and almost wholly undeveloped. The nearest development was in Avila Beach, a small residential area about 11 km (7 miles) southwest of the plant. The property upon which the plant was built had previously been part of the Marré Ranch, and the land had been idle or used for cattle grazing for several years. Close to the ocean, the site's terrain was made up of very rugged shoreline areas with steep, rocky slopes unsuitable for development. The property had been rezoned to commercial and recreational use in 1962, but there was no residential, industrial, commercial, or recreational land use on the site when excavation began (AEC Dockets 50-275 and 50-323).

The construction and operation of Diablo Canyon have not had significant impacts on land use in the plant's immediate vicinity. Diablo Canyon was constructed on part of a 2800-ha (7000-acre) private ranch in a very remote, rugged section of San Luis Obispo County. This meant that there were very few existing land uses to impact in the immediate vicinity and that the area was relatively free from heavy development pressures because of a lack of roads and utilities. The area surrounding the plant is still very rural and undeveloped, and primary land uses are still agriculture and livestock grazing. Local sources indicated that it was not Diablo Canyon's presence but the remoteness and inaccessibility of the area that had restricted further development (NUREG/CR-2749, vol. 5, pp. 181-182).

In developed areas near Diablo Canyon, such as the communities of Avila Beach and Pismo Beach, the plant's land-use impacts also have been minimal. Since the early 1980s, both Avila Beach and Pismo Beach have grown as resort areas with relatively expensive housing, condominium, and hotel/motel development brought about by the region's expanding tourist industry. San Luis Bay Estates, a 480-ha (1200-acre) complex located in Avila Beach about 10 km (6 miles) from Diablo Canyon, represents part of this growth. When completed, San Luis Bay Estates will include a hotel and cottages with 225 rooms, about 800 homes, and a golf course. Another residential development, comprising about 1000 ha (2500 acres), 100 homes, and a golf course, is being planned for the Pecho Ranch property adjoining San Luis Bay Estates. Some of the homes in the new Pecho Ranch complex will be within 6.5 km (4 miles) of Diablo Canyon, the closest residential development to the plant thus far. Sources indicated that the plant's presence had neither encouraged nor impeded residential

or commercial development of this type. In general, Diablo Canyon's overall land-use impacts have been neutral in both Avila Beach and Pismo Beach.

Despite some negative housing impacts from worker in-migration during the plant's construction (peak construction-related growth constituted about 2.6 percent of the county's population), Diablo Canyon has had relatively minor effects on land use in San Luis Obispo County as a whole. One reason for this is Diablo Canyon's extremely remote location. Also, sources felt that the county's residential, commercial, and industrial development patterns were much more susceptible to influences other than Diablo Canyon's presence. Some of the more important determinants of the county's land-use and development patterns were said to include the presence of the University of California at San Luis Obispo and the need to provide student housing; the beauty of the area's beaches coupled with growth in the regional tourist industry; the limited availability of developable land, particularly in urban areas; the local implementation of slow-growth policies; the limited availability of an adequate water supply; and development pressures resulting from the in-migration of residents from Los Angeles and San Francisco. In general, both the direct and indirect land-use impacts of Diablo Canyon's construction and operation have been neutral for the county as a whole.

C.4.3.5.2 Predicted Impacts of License Renewal

The direct and indirect land-use impacts of Diablo Canyon's refurbishment and license renewal term are expected to be small for the area in the plant's immediate vicinity and for San Luis Obispo County as a whole. Land use in the immediate vicinity of the plant is expected to remain unchanged, with

agriculture and livestock grazing being the primary uses. Because of its remoteness and lack of public services, the area is expected to remain undeveloped indefinitely.

Although San Luis Obispo County might experience some housing shortages during the refurbishment period, large-scale residential development is not anticipated as a result of Diablo Canyon's license renewal. Refurbishment-related population growth is projected to be approximately 0.8 percent of the county's projected 2024 population. The population growth projected to result from Diablo Canyon's license renewal term is even smaller, less than 0.1 percent of the county's projected 2024 population. Because increases this small are not likely to create a significant housing demand, the plant's impact on residential development in San Luis Obispo County is expected to remain neutral or be minimal. Future residential, commercial, and industrial development patterns will be increasingly influenced by some of the factors that help dictate the county's land-use patterns now. The most important factors are likely to be the availability of developable land, the enforcement of slow- or no-growth policies, the availability of an adequate water supply, and the continued in-migration of residents from Los Angeles and San Francisco. Tourism- and resort-related residential and commercial development is expected to continue in Avila Beach and Pismo Beach, with neither positive nor negative impacts from Diablo Canyon. Overall, Diablo Canyon's direct and indirect land-use impacts are expected to be small, as has been the case during construction and operation.

C.4.3.6 Economic Structure

C.4.3.6.1 Impacts from Plant Construction and Operation

The construction and operation of Diablo Canyon have resulted in noticeable and insignificant economic impacts, respectively. Table C.42 gives the estimated employment and expenditure effects of the Diablo Canyon plant for residents of San Luis Obispo County. The employment is the sum of direct basic, indirect basic, other basic, and nonbasic employment as described by Mountain West Research, Inc., in *Socioeconomic Impacts of Nuclear Generating Stations: Diablo Canyon Case Study* (NUREG/CR-2749, vol. 5).

Overall, peak construction period employment in 1975 represented 6.5 percent of San Luis Obispo County's total employment, indicating a noticeable impact. Operating term employment in 1990 is approximately 1300 workers, of whom 1160 are residents of San Luis Obispo County. Total Diablo Canyon-related direct and indirect employment in 1990 is estimated to be 1909, or 1.8 percent of the county's total employment. This represents an insignificant impact.

C.4.3.6.2 Predicted Impacts of License Renewal

The impacts of refurbishment and license renewal are expected to be similar to the type of impacts experienced during initial construction and operation. Employment generated by the Diablo Canyon plant after license renewal would, for the most part, represent a continuation of the levels generated before refurbishment.

The work force scenario detailed in Section C.3.1 was used to estimate the

employment effects of refurbishment at Diablo Canyon. Table C.43 shows the total direct and indirect plant-related employment of San Luis Obispo County residents. The methodology used to determine the employment impacts is developed in the Mountain West Research, Inc., study for Diablo Canyon (NUREG/CR-2749, vol. 5). It is projected that Diablo Canyon would employ 1932 county residents as refurbishment workers in 2023 (Section C.4.3.1.2). In addition, indirect employment that would result from purchases of goods and services during refurbishment is projected to create 1310 jobs for San Luis Obispo County residents. The total direct and indirect employment affecting San Luis Obispo County during the peak refurbishment year is therefore projected to be 3242. This employment is projected to represent 1.85 percent of total employment in San Luis Obispo County in 2023, resulting in small impacts.

Relatively few new plant-related jobs would be created at Diablo Canyon during the license renewal term. Nearly all plant-related employment (and associated impacts) expected during that time period would represent a continuation of employment (and impacts) from past operations. Table C.44 shows the impact of the increased labor requirements at Diablo Canyon after 2023.

The license renewal term work force for Diablo Canyon would require an estimated 120 additional employees (Section C.4.3.1.2). Of these additional workers, 107 are projected to be San Luis Obispo County residents. An estimated 77 indirect jobs would also be created by the license renewal term, and 69 of the jobs are expected to be filled by San Luis Obispo County residents. With the continued effects of the plant's current employment and the additional

employment to be created, total direct and indirect license renewal term employment is projected to represent 1.2 percent of San Luis Obispo County's employment in 2023. The employment figure represents a small impact.

C.4.3.7 Historic and Aesthetic Resources

This section describes the impacts that the construction and operation of the Diablo Canyon Nuclear Generating Station Units 1 and 2 have had on historic and aesthetic resources and projects the expected impacts of the plant's refurbishment and post-relicensing operations. Information sources include the *Final Environmental Statement Related to the Nuclear Generating Station Diablo Canyon Units 1 and 2* (AEC Dockets 50-275 and 50-323) and interviews with key informants in San Luis Obispo County and elsewhere in California.

C.4.3.7.1 Impacts from Plant Construction and Operation

The plant's construction and operation have affected no sites on the National Register of Historic Places. During the preconstruction phase, archaeologists hired to survey the site found several prehistoric campsites along Diablo Creek, one dating back 9300 years (the San Luis Obispo 2 site). This was considered an important finding, establishing a new chronology for this area of Central California. Portions of this site have been preserved, but construction of the plant and access road did destroy other sites. The continued operation of the plant has resulted in damage to one of the sites. An evaporation pond sprang a leak and water ran through a site, causing some erosional damage. Another continuing impact on prehistoric resources related to the plant is the continuing loss of land through sloughing off of a bluff near the plant.

Although this erosion problem appears to be unrelated to actual construction of the power plant, restricted access because of plant security has prevented other parties from responding to this problem. Conversely, one source said that the fact that the site and its surroundings are owned by the licensee has protected the area and its historic and aesthetic resources from development more effectively than if the site had been under the ownership of private parties.

Aesthetically, the construction and operation of the plant have had an insignificant impact on the surroundings. This is not because of the physical design of the plant [it is not a low-profile facility: the containment structures are 46 m (150 ft) in diameter and 60 m (200 ft) tall, and the turbine building is 43 m (140 ft) tall and 230 m (750 ft) long] but because of its remote location within an extensive private ranch. The only visual access to the plant for the public is from the Pacific Ocean. The plant cannot be seen even from the private access road until within 1.2 km (0.75 mile) because of the rocky terrain. Along the 19 km (12 miles) of privately held coastline adjacent to the Diablo Canyon site, there is no beach use, swimming, fishing, or beachcombing because of the rocky cliffs and poor accessibility. Hiking, camping, picnicking, and artistic pursuits could be enjoyed on the bluffs above the plant if there were any public access (AEC Dockets 50-275 and 50-323). Erosional scars from the 2400-ha (6000-acre) transmission line right-of-way and its service roads are a source of adverse aesthetic impacts (AEC Dockets 50-275 and 50-323).

C.4.3.7.2 Projected Impacts of License Renewal

The impacts of the Diablo Canyon plant's refurbishment and post-relicensing operation

on historic and aesthetic resources in San Luis Obispo County and on the immediate Pacific Coast environs would likely be less pronounced than those that have occurred during construction and operation of the facility. As in the past, the power plant, which is highly visible only from the Pacific Ocean, would likely have only small aesthetic impacts. If the private land holdings that surround the site were to be developed, there could be extensive public visual access to the site, raising the potential for an adverse impact. Such an impact could be reflected in property values not reaching their full potential.

A respondent cautioned that if additional construction or road maintenance were to occur with refurbishment, there could be impacts to the area's prehistoric and historic resources. However, evaluation of potential impacts to historic resources must occur through consultation with the SHPO as mandated by the National Historic Preservation Act (NHPA) of 1966.

C.4.4 Indian Point

The impact area—those places in which the most pronounced socioeconomic impacts might result from refurbishment—for Indian Point consists of Westchester and Dutchess counties. The assessment of land use and public services involves only Westchester County. The selection of this area is based on worker residence patterns, employment, expenditures, and tax payments. Figure C.10 depicts the impact area, and Figure C.11 shows the region in which it is located.

C.4.4.1 Population

This section discusses the local population growth associated with the construction, operation, and license renewal of the Indian Point Nuclear Generating Plant.

Section C.4.1 describes the methodology used to project population growth for all plants. Data used to prepare this section were obtained from the *Final Environmental Statements Related to the Operation of Indian Point Nuclear Generating Plant, Units 2 and 3* (AEC Dockets 50-247 and 50-286); *Environmental Assessment for Proposed Rule on Nuclear Plant License Renewal* (NUREG-1398); SEA refurbishment work force estimates (Appendix B; SEA 1994); population projections by the New York Department of Commerce (Division of Economic Research and Statistics) (Krausharr 1990); the Consolidated Edison Company (ConEd) of New York; and the New York Power Authority.

The discussion of population growth is organized into two time periods. Section C.4.4.1.1 identifies the population growth that Dutchess and Westchester counties have experienced as a result of the construction and operation of Indian Point Units 2 and 3 from 1965 to 1990. Section C.4.4.1.2 projects the population growth that is expected to result from Indian Point's refurbishment period and license renewal term operations beginning in 2013 (Unit 2) based on the growth associated with the plant's initial construction. Also, Section C.4.4.1.2 projects the population growth expected to result from Indian Point's license renewal term based on the growth associated with operations in the past.

C.4.4.1.1 Growth Resulting from Plant Construction and Operation

Because Indian Point was not included in the NUREG/CR-2749 study, estimates of worker in-migration are based on the construction experience at other nuclear plants in comparable locales, especially Oconee and Three Mile Island. Indian

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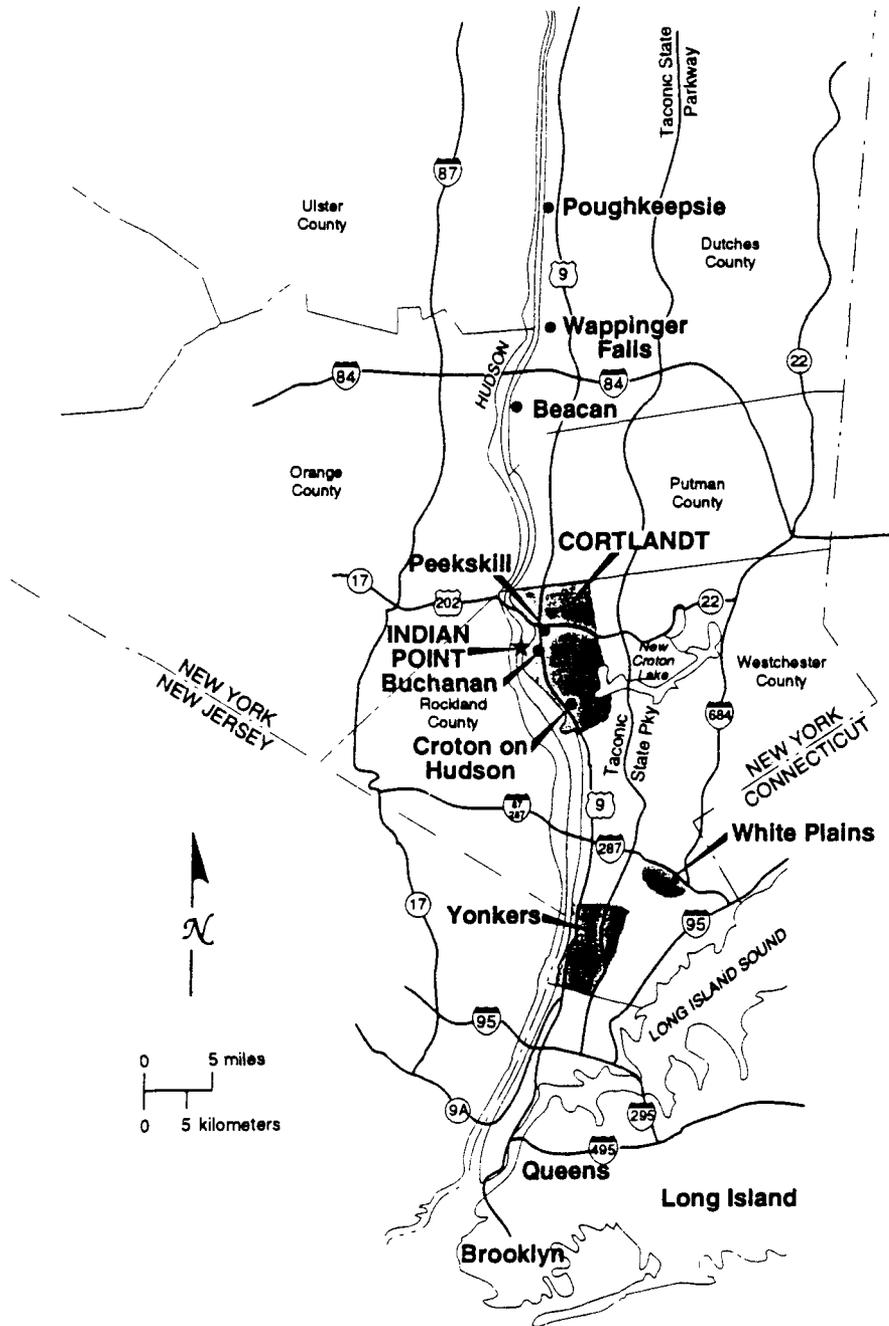


Figure C.10 Socioeconomic impact area associated with Indian Point refurbishment: Westchester and Dutchess counties.

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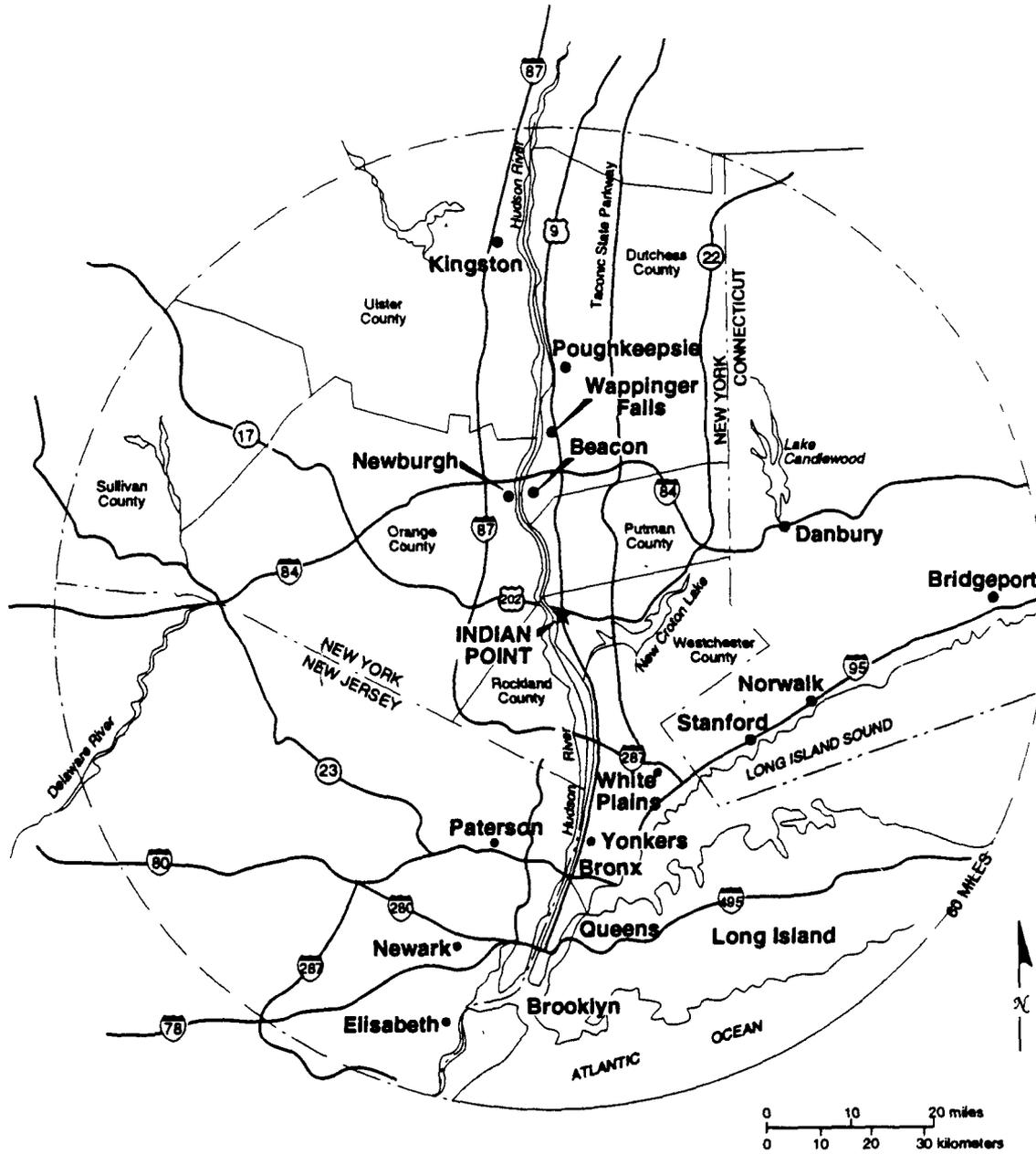


Figure C.11 Region surrounding the Indian Point nuclear plant.

Point's construction resulted in very small population increases in Dutchess and Westchester counties (Table C.45). During the peak construction period at Unit 2, there were approximately 1200 construction workers on-site (AEC Docket 50-247, p. IV-4). Assuming the same size work force for Unit 3, as many as 2400 workers were on-site while both units were under construction during the early 1970s. Based on construction experience at other nuclear plants with similar locales—i.e., areas with relatively low population density compared to larger urban areas located within a short commuting distance—it is estimated that approximately 17.3 percent (415 persons) of the peak construction period work force lived in Dutchess County and 12.7 percent (305) lived in Westchester County (Tables C.46 and C.47). This distribution reflects current work force distribution at Indian Point (ConEd 1990; PASNY 1990). An estimated 30 percent of the construction work force lived in the study area. It is estimated that 35 percent of the construction workers residing in Dutchess or Westchester counties (252 persons) were workers who migrated to the study area for jobs at the plant (Tables C.46 and C.47). Based on the pattern of construction workers' in-migration at other nuclear projects, it is estimated that 51 percent of the in-migrants (129 workers) were accompanied by their families and that their average household size was 3.25 persons. Together, this represents a total in-migration of 312 residents for Dutchess County and 231 new residents for Westchester County. Based on construction in-migration and the ratio of nonplant jobs created during peak construction periods at nuclear plants in comparable locales, it is estimated that Indian Point's peak construction period created an additional 1560 jobs in service industries supported by the spending of construction workers. As a result of these

indirect jobs, an estimated 31 additional workers and their families (a total of 78 persons) moved into each study area county (Tables C.46 and C.47).

In all, approximately 390 new residents moved into Dutchess County and 309 people migrated into Westchester County as a result of Indian Point's peak construction period. These residents made up about 0.2 percent of Dutchess County's 1972 population of 226,673 and about 0.03 percent of Westchester County's 1972 population of 888,691.

Operations at Indian Point have resulted in less population growth than did the plant's construction. In 1990, 1335 permanent plant staff were on-site at Indian Point (additional contract workers have been on-site during outages, but they are not included in this number because their presence at the plant was temporary). Of the permanent work force, 37.8 percent (505) resided in Dutchess County and 27.8 percent (371) resided in Westchester County (ConEd 1990; PASNY 1990). Based on the residential settlement pattern of workers at nuclear plants in comparable locales and on construction experience at Indian Point, it is estimated that 30 percent (263) of the workers residing in Dutchess and Westchester counties in 1990 were persons who migrated to the study area to work at the plant (Tables C.48 and C.49). Also following the pattern set by personnel in-migrating to work at other nuclear plants, it is estimated that 66 percent (174) of the in-migrants were accompanied by their families. Assuming the 1990 New York average family size of 3.22 persons, this represented a total in-migration of 374 new residents for Dutchess County and 275 new residents for Westchester County (Tables C.48 and C.49). Based on work force in-migration and the ratio of plant to nonplant jobs created at other nuclear plants

during operating periods, it is estimated that Indian Point's 1990 operations created an additional 868 indirect jobs in service industries supported by the spending of plant workers. As a result of these indirect jobs, an estimated 17 additional workers and their families (a total of 41 persons) moved into each study area county (Tables C.48 and C.49).

In all, approximately 415 new residents moved into Dutchess County, and 316 persons into Westchester County, as a result of Indian Point's 1990 operations. These new residents made up about 0.16 percent of Dutchess County's 1990 population of 259,462 and about 0.04 percent of Westchester County's 1990 population of 874,866.

C.4.4.1.2 Predicted Growth Resulting from License Renewal

As discussed in Section C.3.1, Indian Point's license renewal would require the completion of a number of refurbishment tasks for Units 2 and 3. Many of the refurbishment tasks are expected to be completed during scheduled refueling outages at each unit during the 10 years that precede the expiration of the initial operating license. However, the final refurbishment work is expected to be completed during one large refurbishment outage scheduled for each unit in the year before the unit's initial operating license expires. Because the final refurbishment outage would involve more workers on-site over a longer period of time than any of the preceding refueling outages, it represents the peak refurbishment period. For other assumptions concerning the refurbishment work force, refer to Sections C.3.1 and C.4.1.1.2.

Assuming the refurbishment schedule as described in Section C.3.1, the peak refurbishment year for Indian Point Unit 2 is expected to be 2012, and the peak refurbishment year for Indian Point Unit 3 is expected to be 2015. For each unit, the on-site refurbishment work force would be about the same size, and the work force would be on-site for approximately the same period of time (refer to Section C.4.1.2 for other work force assumptions). However, because of uncertainties concerning the length of the outage and the size of the work force required to complete the refurbishment of a given unit, this section examines a bounding case work force scenario as described in Section C.3.1.

Given the work force scenario detailed in Section C.3.1, it is estimated that 2273 workers would be on-site to complete refurbishment of Indian Point Unit 2 in 2012 and Unit 3 in 2015 (SEA 1994). Further assuming that the residential distribution of refurbishment workers would be similar to that estimated for the 1972 construction work force, it is estimated that approximately 30 percent (543) would reside in either Dutchess County or Westchester County. Based on the residential distribution of Indian Point plant staff, it is estimated that 17.3 percent (393) would reside in Dutchess County and that 12.7 percent (289) of the total work force would reside in Westchester County (Tables C.50 and C.51). For Indian Point, estimates of refurbishment worker in-migration are based on construction experience at nuclear plants located in areas with similar characteristics to the region in which Indian Point is located. It is estimated that 35 percent (239) of the refurbishment workers living in either Dutchess County or Westchester County would be workers who migrate into the area for jobs at Indian Point. Based on the pattern of construction workers' in-migration

at other nuclear projects, 51 percent of the in-migrants (122) would be accompanied by families. Using the New York average family size of 3.22 persons, total refurbishment worker in-migration would be expected to result in 293 new residents for Dutchess County and 216 new residents for Westchester County. Based on construction in-migration and the ratio of nonplant jobs created during peak construction periods at nuclear plants in comparable locales, it is estimated that Indian Point's refurbishment would create an additional 1477 indirect jobs in service industries supported by the spending of refurbishment workers. As a result of these indirect jobs, an estimated 59 additional workers and their families (a total of 148 persons) would be projected to move into the study area. Of these additional in-migrants, 74 would move into each study area county (Tables C.50 and C.51). In all, approximately 367 new residents would be expected to move into Dutchess County and 290 new residents into Westchester County, as a result of Indian Point's refurbishment. That would represent 0.1 percent of Dutchess County's projected population of 310,809 in 2013 and less than 0.1 percent of Westchester County's projected population of 846,861 in 2013.

Once plant refurbishment is completed for Indian Point Units 2 and 3, the work force would consist mostly of permanent plant staff. Additional refurbishment/refueling workers would be temporarily on-site approximately every 2 years; however, they would not be permanent, on-site plant staff, and many of them are expected to commute from outside the study area. It is expected that a maximum of 60 additional permanent workers per unit would be required during the license renewal term, adding 120 workers to Indian Point's existing work force. Assuming that the new workers' residential distribution would be the same as

current workers', approximately 37.8 percent (45) would reside in Dutchess County, and 27.8 percent (33) would reside in Westchester County (ConEd 1990; PASNY 1990). Based on operating experience at nuclear plants in comparable locales and on construction experience at Indian Point, it is estimated that 30 percent (23) of the plant staff who would reside in Dutchess County or Westchester County would be persons who migrated to the area to work at Indian Point (Tables C.52 and C.53). Also following the pattern set by personnel in-migrating to work at other nuclear plants, 66 percent of the in-migrants (16) would be accompanied by their families. Using the New York average family size of 3.22 people, total in-migration would be expected to result in 33 new residents for Dutchess County and 26 new residents for Westchester County. Based on work force in-migration and the ratio of nonplant jobs created at other nuclear plants during operating periods, it is estimated that Indian Point's license renewal term would create an additional 78 indirect jobs in service industries supported by the spending of plant workers. As a result of these indirect jobs, an estimated two additional workers (six persons including families) would be projected to move into each study area county (Tables C.52 and C.53). In all, approximately 39 new residents would be expected to move into Dutchess County and 32 new residents into Westchester County, as a result of Indian Point's license renewal term. That would represent less than 0.1 percent of Dutchess County's projected population and less than 0.1 percent of Westchester County's projected population in 2013.

C.4.4.2 Housing

The following sections (1) examine the housing impacts that occurred in Westchester and Dutchess counties during

construction and operation of Indian Point and (2) predict housing impacts that would result from refurbishment activities and continued operation during the license renewal term. Possible impacts to housing include changes in the number of housing units, particularly the rate of growth of the housing stock; changes in occupancy rates; changes in the characteristics of the housing stock; and changes in rental rates and property values.

Section C.4.1.2 includes a complete discussion of the methodology and assumptions used to predict housing impacts.

C.4.4.2.1 Impacts from Plant Construction and Operation

The following discussion begins by describing project-related housing demand in Westchester and Dutchess counties and compares it to the 1970 housing market. Impacts from the operation of Indian Point on local housing are then described. Because Indian Point was not included in the NUREG/CR-2749 study, estimates of worker in-migration are based on the construction experience at other nuclear plants in comparable locales (Section C.4.4.1).

Peak construction work force of 2400 occurred in the early 1970s when both Units 2 and 3 were under construction. Because such a large labor pool existed within reasonable commuting time in the local area and in New York City, very little in-migration occurred. Only 252 project workers moved to Westchester and Dutchess counties combined to work at the site. In Dutchess County, in-migrating workers required 134 housing units, and those who moved to Westchester County required 99 housing units. Indirect jobs created by the spending of project workers brought in another 60 workers to Dutchess County and

44 to Westchester. Thus, the total project-related housing demand was for 194 units in Dutchess County and 143 units in Westchester. Project demand accounted for only 0.28 percent of the year-round housing units in Dutchess County and 0.04 percent of the year-round units in Westchester.

Westchester County in 1970 had over 3000 vacant rental units and 812 units for sale (U.S. Bureau of the Census 1972). Project-related demand would occupy only a fraction of the vacant units. Similarly, 1400 vacant rental units and 517 units were for sale in Dutchess County. Because project-related demand made up only a minuscule portion of the housing markets of both Dutchess and Westchester counties, no discernable change in the housing market or in housing values occurred.

Most local planners and realtors believe that the operation of the Indian Point plants has not inhibited residential growth in neighboring communities of Buchanan, Peekskill, and Verplank, and the town of Cortlandt. Rather, the low property taxes and good school district have served to encourage residential development and facilitate the quick sale of existing housing. Local residents express no reluctance about living near the plants, although occasionally an outside buyer is deterred from the area because of the plants. However, there are always other buyers for the property, so the housing market has not slowed. Conversely, one realtor maintains that more development in communities neighboring Indian Point would have occurred had it not been for Indian Point.

Local realtors agree that housing values in communities neighboring the plant have not been deflated because of the presence of Indian Point. Homes in the immediate area are moderately priced and are currently

selling very fast on the market. Developments within 3 km (2 miles) of the plant include homes in the \$400,000 to \$600,000 range. Representatives of the Westchester County Office of Community Development believe otherwise, however, and indicated that the presence of the plant had perpetuated the image of these communities being low to middle class.

In summary, it appears that neither construction nor operation of the Indian Point plants has considerably affected housing in the communities neighboring the plants or in the whole of Westchester and Dutchess counties.

C.4.4.2.2 Predicted Impacts of License Renewal

Project-related population increase and the commensurate housing demand would be the cause of new housing impacts during refurbishment activities. A summary of recent and anticipated growth in housing is provided. This is followed by predictions of possible impacts during refurbishment and the license renewal term.

Housing in Westchester County expanded between 1980 and 1990 by 6.3 percent (U.S. Bureau of the Census 1990). If expansion continues at this rate, there would be about 419,500 housing units in 2012, the peak year of refurbishment at Indian Point Unit 2. Historical growth trends in Dutchess County suggest that by 2012 there could be about 126,500 housing units (U.S. Bureau of the Census 1988, 1990). The projected populations of Westchester and Dutchess counties in 2012 are 846,861 and 310,809, respectively, and will require approximately 321,000 and 115,500 housing units. Although adjustments in housing growth will be made according to population growth, the current rate of growth suggests that there will be

available housing in the study area during refurbishment activities.

According to the estimate of the number of workers required for plant refurbishment and based on plant construction experience, 138 workers of the total work force of 2273 are expected to migrate to Dutchess County and 101 workers are expected to migrate to Westchester County for refurbishment jobs. Of these in-migrants, 51 percent are expected to be accompanied by families. Some doubling-up is expected to occur among the unaccompanied workers, so that each unaccompanied mover would require 0.85 housing unit. This results in a refurbishment-related housing demand in the peak year of refurbishment of 128 housing units in Dutchess County and 94 units in Westchester County. Also, in-migrants filling indirect jobs created by the spending of project workers would require 30 units in each study area county, bringing the total project-related housing demand to 158 and 124 units in Dutchess County and Westchester County, respectively.

Refurbishment-related housing demand is less than the original construction-related housing demand of 194 and 143 units in Dutchess and Westchester counties. The number of housing units will have increased by about 85 percent in Dutchess County and 44 percent in Westchester County between peak construction and refurbishment periods. Refurbishment-related housing demand would account for 0.1 percent and 0.02 percent of the projected number of housing units in 2012 in Dutchess and Westchester counties, respectively. Housing demand during refurbishment would be tiny relative to the existing housing market and is even less than that experienced during construction. Only small new impacts on housing would result.

Housing impacts related to housing value and marketability that occur during the license renewal term are the same as those currently being experienced (Section C.4.4.2.1). The 120 additional workers (60 per unit) required during the license renewal term and the commensurate housing demand would cause only small new housing impacts.

C.4.4.3 Taxes

Two operating reactors are currently at Indian Point. Indian Point Unit 2 is owned and operated by ConEd, and Indian Point Unit 3 is owned and operated by the Power Authority of the State of New York (PASNY). Although PASNY is not subject to local taxes, it makes payments in lieu of tax based on its assessed valuation.

C.4.4.3.1 Impacts from Plant Construction and Operation

The town of Cortlandt and the village of Buchanan both collect taxes from Indian Point Unit 2. The town of Cortlandt is a political jurisdiction in Westchester County that provides services to unincorporated areas within its boundaries. It collects taxes for its general budget and special districts, fire districts, and the Hendrick Hudson School District. The village of Buchanan, where Indian Point Nuclear Plant is located, is an incorporation within the town of Cortlandt's boundaries. It is a separate taxing jurisdiction and independently assesses and levies taxes on Indian Point Unit 2. The Verplank Fire District, which includes the Indian Point Nuclear Plant, had an \$8.21 tax rate per \$1000 of assessment (Town of Cortlandt 1990b). The assessment of Indian Point Unit 2 is approximately 5.76 percent of the fair market value of the property. The existing tax rate is 0.123 in the village of Buchanan and an additional 0.245

in the town of Cortlandt, which is a combined effective tax rate of about 2.1 percent on fair market value. Westchester County does not receive tax revenues from Indian Point.

Table C.54 presents the taxes paid by Indian Point Unit 2 and the payments in lieu of tax from Indian Point Unit 3. The Hendrick Hudson School District is the only special taxing jurisdiction detailed because it receives such a large share of local tax revenues. These tax revenues indicate that Indian Point Unit 2 has been an increasing source of tax revenues, whereas Indian Point Unit 3 has been declining in importance as a source of revenues. The net effect has been a fairly constant stream of revenues. Indian Point Unit 3 will continue to decline as a source of revenues according to a formula that reduces each annual assessment by 2 percent of the total property tax assessment in the village of Buchanan and the Hendrick Hudson School District.

Table C.55 demonstrates that the tax base provided by the Indian Point Nuclear Plant is very important to the town of Cortlandt, the village of Buchanan, and the Hendrick Hudson School District. Together, Indian Point Units 2 and 3 make up the majority of each jurisdiction's total assessed valuation; but Buchanan, where 91.8 percent of the total assessed value is provided by Indian Point Units 2 and 3, is the most notable. The town of Cortlandt does not receive revenue from Indian Point Unit 2 except for the Verplank Fire District. The fire district had a transitional assessed value for Indian Point Unit 3 of about \$10 million in 1990, which translated into \$81,464 in lieu of tax revenues. The Hendrick Hudson School District has about 5 percent of its assessed value attributed to Indian Point Unit 3, and the village of Buchanan has about 29 percent of its value from Indian Point

Unit 3. Indian Point Unit 3 will cease to be a source of revenues for the school district within about 2 years and will continue to gradually decline in importance as a source of revenues for the village of Buchanan and the Verplank Fire District as a result of the assessment formula previously noted.

Table C.56 provides the total revenues and revenues received from Indian Point for each taxing jurisdiction. The contribution Indian Point makes to the total revenues of each of these jurisdictions is significant and ranges from 33.3 to 49.6 percent.

The practical effect of the property tax valuation of Indian Point and the resulting revenues has been the local government's ability to maintain a high level of service with relatively low property tax rates. For instance, the Hendrick Hudson School District has an average of 11 students per teacher (on par with most Westchester County school districts and considerably lower than the statewide average) (New York State Education Department 1990) while having the third lowest rate of taxation out of 40 school districts in Westchester County.

C.4.4.3.2 Predicted Impacts of License Renewal

The new tax-related impact expected to occur during refurbishment of Indian Point results from capital improvements undertaken during the current term outages. The assessed value of the plant would increase during this time and thus increase the tax payments of Indian Point Unit 2 to local jurisdictions. Whether PASNY would have to pay additional taxes (or payments in lieu of tax) to local jurisdictions because of improvements to Indian Point Unit 3 is unknown. This new impact does not involve capital improvements that take place during

the final refurbishment outage, and that would be reflected in the plant's assessed value during the license renewal term. The magnitude of the new impact depends on which improvements would occur at Indian Point early on and which would be done during the final outage. For example, if the steam generator is replaced during a current term outage, the assessed value may increase considerably before the license renewal term begins. If steam generator replacement and other major capital improvements are not undertaken early on, the increase in assessed valuation may be only minor. The increase, in either case, is expected to cause only a small to moderate new tax impact.

During the license renewal term, the primary tax-related impact would be the continuation of tax payments that Indian Point Unit 2 is currently making to local jurisdictions. Again, it is unclear whether taxing arrangements regarding Indian Point Unit 3 would change so that PASNY would make payments to local jurisdictions during the license renewal term. There would also be a new impact resulting from the increase in tax payments because of improvements made at Indian Point during the final refurbishment period. Thus, tax revenues of Indian Point Unit 2 would increase in absolute terms but might remain constant or decrease as a percentage of total revenues of the taxing jurisdictions. Based on current conditions, Indian Point Unit 2 tax revenues—the continuing and additional payments combined—would continue to be a large source of local revenues during the license renewal term and would allow local taxing jurisdictions to maintain adequate levels of local government service, including education and highways.

C.4.4.4 Public Services

C.4.4.4.1 Impacts from Plant Construction and Operation

Westchester County is divided into towns and villages. All social services are provided by the county. Schools are divided into districts (43 in the county), with town governments having no involvement in the education. One village, Buchanan, made strategic plans during the construction of the plant for growth of its infrastructure. Buchanan experienced good fiscal growth, and several services were made possible as a direct result of the Indian Point Nuclear Plant.

Education

The state of New York is divided into numerous school districts. School districts within 0.8 km (0.5 mile) of Indian Point are the Lakeland School District, Peekskill School District, Hendrick Hudson School District, and the Croton Harmon School District. Indian Point is located in the Hendrick Hudson School District.

The Hendrick Hudson School District had the same number of schools before the construction of the plant. However, two of the elementary school buildings were replaced, one in 1965 and the other in 1974. The local school administrator indicated that the construction and operations phases of Indian Point have not had an effect on schools in the district. An increase in enrollment was concurrent with the development of Indian Point. However, there was also a nationwide baby boom at this time, so this enrollment cannot be directly linked to the plant.

Local school officials in each of the school districts were interviewed, and the overall

finding was insignificant impacts because of the construction or operation of the plant. The Croton Harmon director of pupil services indicated very little change since the construction of the plant. The Lakeland School District experienced substantial growth in the 1950s and 1960s, reaching a peak enrollment in 1973. Although this growth occurred at roughly the same time as the plant construction, the construction itself did not have a major effect on the district. The Lakeland School District has been more heavily influenced during operations by industry in the Poughkeepsie and Yorktown area as opposed to the operation of the plant.

Transportation

Transportation in Westchester County consists of approximately 240 km (150 miles) of county roads and more than 970 km (600 miles) of state roads. Local officials interviewed gave no indication of major problems stemming from the construction or the operations of Indian Point Nuclear Plant.

Public Safety

Some municipalities have local police departments, whereas others contract with the New York State Police for police protection. Individuals interviewed in the municipality of Buchanan indicated that because of the fiscal growth associated with Indian Point, the services and staff of the village also grew. For instance, the police force has essentially doubled in size. More than 70 percent of the fire departments are on a volunteer basis. Local emergency management is operated through the Office of Defense and Emergency Services.

A four-county nuclear safety committee is in the area, with Westchester County being the

lead county. An in-depth plan is in place, and the department works closely with the state, the Federal Emergency Management Agency (FEMA), ConEd, and PASNY. One major drill and 10 to 20 mini-drills are conducted each year. Money for this department comes from assessment of Indian Point and from the county government.

Social Services

Social services are provided for at a county level. Local officials interviewed stated that since plant operations began, there had been no increase in the demand for services from the department. However, it was indicated that more staff was required in the beginning to develop a new emergency plan for the county. Some municipalities have senior citizen programs or "Meals on Wheels."

Public Utilities

Two power companies supply gas and electricity to Westchester County. Water in the area is provided by the Montrose District. Some of the smaller municipalities have a split between private and public sewer systems. Local officials interviewed gave no indication of any impacts from the construction or operation of Indian Point.

Tourism and Recreation

Local leaders interviewed indicated no change in tourism. Most people do not remember the plant is even there. The county operates an extensive park system of 65–78 km² (25–30 square miles). The plant did, however, provide one municipality with the capability of building a recreation complex and a public pool.

Indian Point now has an emergency preparedness plan in effect. This plan is

noteworthy to the tourist industry because it not only accounts for the needs of the residents near the plant but also addresses plans for evacuating the transient population and tourists in the area.

ConEd operates an information center at the plant site. This center is visited mostly by school and tour groups. At the plant, visitors can see the control room, watch films, and see hands-on exhibits.

C.4.4.2 Predicted Impacts of License Renewal

Based on the estimated 2273 direct workers required during peak refurbishment, the staff estimates that 122 direct workers and 40 indirect workers will migrate with their families to the study area counties (Section C.4.4.1.2). The number of children accompanying these workers is estimated using the New York average family size (3.22) and assuming that all families include two adults. Children are expected to be evenly distributed in age from ≤ 1 to 18 years. Assuming 72.2 percent of these children are school age (5 to 18 years), there will be an average of 0.88 school-age children per in-migrating family, or a total of 144 new students in the study area counties. This would represent a tiny increase in the school enrollments of the study area counties, even if all new students were concentrated in one school district. Impacts to education, if any, will be small.

During construction and operation of Indian Point, there were no notable impacts on any of the public services. Future impacts are projected to be largely the same as those that occurred during past operations.

C.4.4.5 Off-Site Land Use

This section describes the off-site land-use impacts of the construction, operation, and license renewal of Indian Point. The discussion of impacts is primarily concerned with land use in the immediate vicinity of the plant, but impacts to the town of Cortlandt, the villages of Buchanan and Peekskill, and Westchester County are described where appropriate. Land-use impacts are examined for two time periods. First, Section C.4.4.5.1 identifies the land-use impacts of Indian Point's construction and operation. Next, Section C.4.4.5.2 projects the land-use impacts of Indian Point's refurbishment period, based on the impacts that occurred during the plant's construction. Also, Section C.4.4.5.2 projects the land-use impacts of the plant's license renewal term, based on the impacts that have occurred during operations. Information sources for this report include the *Final Environmental Statement Related to the Operation of Indian Point Nuclear Generating Plant, Units 2 and 3* (AEC Dockets 50-247 and 50-286) and interviews with key information sources in Westchester County. Section C.4.1.5 describes the methods used to assess and project land-use impacts for all case study plants.

C.4.4.5.1 Impacts from Plant Construction and Operation

Indian Point is located on a 96.7-ha (239-acre) site on the Hudson River. Before the beginning of Indian Point's construction in 1956, the plant property was the abandoned site of the Palisades Amusement Park, and much of the surrounding property was vacant. By the time Units 2 and 3 began operations, land in the immediate vicinity of the plant site had been zoned for heavy industrial use, and some of it had been

developed. The Georgia-Pacific Corporation operated a wallboard factory just southwest of the Indian Point site, and a number of industrial facilities were owned by the Standard Brands Corporation in Peekskill, just north of the nuclear plant's property boundary. The plant site was bounded by Broadway, a minor public road, to the east and by the Hudson River to the west. In Buchanan, land use in the plant's general vicinity consisted mostly of low-density, single-family residential development and some limited commercial uses. The mountainous, wooded property on the west bank of the Hudson across from Indian Point was part of the Palisades Interstate Park and was mostly devoid of development.

Indian Point's construction had very minor direct land-use impacts on property in the immediate vicinity of the plant. The abandoned amusement park site provided more than adequate land area for the three units and their associated buildings and storage facilities. Because the site was so large and had been developed previously, the disruption of additional property outside the park's boundaries was not necessary (AEC Dockets 50-247 and 50-286).

However, the plant's construction did have noticeable direct land-use impacts on the village of Buchanan. Since the late nineteenth century, development along the Hudson River near Buchanan had been made up largely of river-oriented commercial land uses such as quarrying. But by the time Indian Point's construction began, much of this commercial development had slowed to a halt. The commercial void turned Buchanan into an economically depressed area with no industrial development to support the existing residential land use. According to one key informant, Indian Point's construction gave Buchanan the opportunity to develop industrial properties.

This was because the village had rezoned much of its land along the river to the industrial classification for Indian Point's construction, and some of the surrounding property was subsequently developed for other industrial uses. The industrial growth included the Georgia-Pacific and Standard Brands facilities south and north of Indian Point, respectively. This new development helped bolster Buchanan's economy and established the industrial land-use pattern that has dominated development along the Hudson in Buchanan since Indian Point's construction.

Indian Point's operation has also had noticeable land-use impacts in the immediate vicinity of the plant, in the town of Cortlandt and in Buchanan and Peekskill. Some informants stated that the plant, and especially its transformers and transmission lines, might have deterred some residential development in Buchanan. This is one explanation offered for the existence of some large, vacant properties near the plant. The informants cited development pressures and the demand for housing in the region, as well as the favorable location of the properties in terms of transportation routes and the Hudson River, and asserted that the plant's presence might account for the fact that the properties are not developed. Conversely, some informants felt that Indian Point's local tax contributions had allowed the town of Cortlandt and the village of Buchanan to maintain relatively low property tax rates and that this had encouraged new residential development. Either way, Buchanan is still primarily a residential area, with some relatively expensive homes built within 1.5 km (1 mile) of Indian Point. Because residential growth has continued in Buchanan within a short distance of Indian Point, the overall land-use impacts of the plant's presence seem to be neutral in terms of residential development patterns.

Key sources also indicated that the nuclear plant's presence and the industrial development that it helped spawn in Buchanan had helped encourage industrial development in Peekskill. North of Indian Point, the village of Peekskill has developed the old Standard Brands complex into the Charles Point Industrial Park. The Charles Point complex, which is the site of the Charles Point Resource Recovery Plant (the county's waste disposal facility), has been very successful in attracting small industries. Indian Point's successful location and operation encouraged the villages of Buchanan and Peekskill to promote industrial development around the nuclear plant and at Charles Point. This development has established industry as the dominant land use along the river in the two villages. In general, operations at Indian Point have had noticeable impacts on both residential and industrial development patterns in Buchanan and Peekskill.

C.4.4.5.2 Predicted Impacts of License Renewal

The direct impacts of Indian Point's refurbishment and license renewal term on land use in the immediate vicinity of the plant, in Buchanan and Peekskill, and in Westchester County are expected to be small. Refurbishment-related population growth is projected to represent less than 0.1 percent of Westchester County's projected population in 2013. Population growth associated with the license renewal term is also projected to account for less than 0.1 percent of the county's projected population in 2013. Increases this small during refurbishment and the license renewal term are likely to have no impacts in terms of residential development patterns.

Because much of the land in the plant's vicinity has been zoned for industrial use

and because the industrial land-use pattern has become well established along the river in Buchanan, it is expected that the area would continue to attract some industrial development. This is especially true for the Charles Point Industrial Park, which would continue to cater to smaller, light industries and warehouse operations. Also, there are two large, vacant properties, one zoned for manufacturing and the other for light industry, in Buchanan near Indian Point. The parcel zoned for light industrial use is adjacent to the Indian Point property and is currently being developed as warehouse space. Because the residential and industrial land-use patterns that exist in Buchanan have been established for many years, Indian Point's new direct land-use impacts are expected to be small.

The indirect land-use impacts of the license renewal term at Indian Point are also expected to be small. This is because Indian Point Unit 3 was acquired by PASNY in 1978, and the authority has been making annually decreasing payments in lieu of tax to the local jurisdictions since that time. Thus, the village of Buchanan and the town of Cortlandt have had to increase their property tax rates to compensate for losing those portions of their tax bases that had been provided by ConEd for Unit 3. Key informants felt that this increase in property tax rates had already caused a decrease in the demand for residential development in the area and that this indirect land-use impact is likely to continue. Overall, however, Indian Point's refurbishment and license renewal term are expected to have small direct and indirect land-use impacts.

C.4.4.6 Economic Structure

C.4.4.6.1 Impacts from Plant Construction and Operation

The construction and operation of Indian Point have resulted in insignificant economic impacts to Westchester and Dutchess counties. Table C.57 presents the estimated employment and income effects of Indian Point on residents of the two counties. The plant has increased employment and income for residents employed during its construction and operation, and this direct employment and income has generated local expenditures resulting in indirect employment and income. But the percentage of each county's employment and income that is derived from Indian Point indicates the insignificance of the plant's economic impacts on the counties.

C.4.4.6.2 Predicted Impacts of License Renewal

The work force scenario detailed in Section C.3.1 was used to estimate the employment and economic effects of refurbishment at Indian Point. Table C.58 shows the total direct and indirect plant-related employment of Dutchess and Westchester county residents during refurbishment.

It is projected that Indian Point would employ 393 Dutchess County residents and 289 Westchester County residents as refurbishment workers in 2012 (Section C.4.4.1.2). Indirect jobs that would result from purchases of goods and services during refurbishment are expected to employ 591 residents of each study area county.

Therefore, the total direct and indirect employment affecting Dutchess County during the peak refurbishment year is

projected to be 984. This employment is projected to represent 0.5 percent of the total employment in Dutchess County in 2012, resulting in small impacts.

There would be smaller employment impacts in Westchester County, assuming the bounding case work force scenario. The total direct and indirect employment affecting Westchester County during the peak refurbishment year is projected to be 880. It is projected that this would represent only 0.2 percent of the county's employment in Westchester County in 2012. The impacts to employment in Westchester County are expected to be small.

Relatively few new plant-related jobs would be created at Indian Point during the license renewal term. Nearly all plant-related employment (and associated impacts) expected during that time period would represent a continuation of employment (and impacts) from past operations. Table C.59 shows the estimated impact on Dutchess and Westchester counties from the increased labor requirements at Indian Point after refurbishment in 2015.

The license renewal term work force for Indian Point would require an estimated 120 additional employees (Section C.4.4.1.2). Of those additional workers, 45 are projected to be Dutchess County residents and 33 are projected to be Westchester County residents. In addition, license renewal is expected to create indirect jobs for 45 Dutchess County residents and 33 Westchester County residents. With the continued effects of the plant's current employment and the additional employment to be created, total license renewal term employment is estimated to represent 0.60 percent of Dutchess County employment, resulting in small impacts. Total license renewal term employment is

projected to represent 0.13 percent of Westchester County employment, also representing small impacts.

Table C.59 indicates that the economic effect of Indian Point on Dutchess and Westchester counties is small in relative terms but is still a crucial component of employment for the town of Cortlandt, the village of Buchanan, and the Hendrick Hudson School District in Westchester County. License renewal would also maintain Indian Point as a source of property tax revenues, which could enable these localities to maintain lower residential and business tax rates and thereby attract economic development.

C.4.4.7 Historic and Aesthetic Resources

This section describes the impacts that the construction and operation of Indian Point have had on historic and aesthetic resources and projects the expected impacts of the plant's refurbishment and post-relicensing operations. Information sources include the *Final Environmental Statement Related to Operation of Indian Point Nuclear Generating Plant, Unit 2* (AEC Docket 50-247), *Final Environmental Statement Related to Operation of Indian Point Nuclear Generating Plant, Unit 3* (AEC Docket 50-286), and interviews with key information sources in Westchester County and elsewhere in New York.

C.4.4.7.1 Impacts from Plant Construction and Operation

The construction and operation of Indian Point have had noticeable impacts on historic resources and significant impacts on the aesthetic resources of the area. The site is located within 40 km (25 miles) of the city limits of New York City, in affluent and influential Westchester County, arguably the

birthplace of the country's environmental movement. The plant is built near the gateway to the Hudson Highlands, one of only two highly scenic areas remaining along the Hudson River between New York City and Albany that retains much of the nineteenth-century appearance and character. The area is important historically as a locale for American Revolutionary War battlefields and activities and is located near the U.S. Military Academy at West Point. One informant characterized this importance as being "extreme," both statewide and nationally. Another characterizes the Indian Plant environs as being "one of the most important historic areas in the state." It should be noted that the plant is visible from very few historic resources, based on a viewshed analysis (Jones & Jones 1975).

The plant's location—on the east banks of a point of land near a large bend in the Hudson River—accentuates the visibility of its containment vessels. Although the general area, particularly north of the plant, is noted for its scenic quality, the immediate plant environs has other industrial uses that detract from the overall scenic context. The whole facility is easily viewed by passengers riding the heavily traveled Amtrak trains running between New York City and Albany. One informant characterizes this impact alone as a "big visual impact." Several sections of the Palisades Interstate Park on the west bank of the Hudson River are at this point, as well as parks and beaches on the east bank and various fishermen's landings. Both commercial and pleasure boating predominate in this area of the Hudson River.

Repeated comments from key sources document the uniform sense of intrusion that the plant has given to the area's aesthetic quality. Among the chief concerns has been the visibility of the plant from

Harriman State Park and Bear Mountain State Park.

The impact results from the effect of strong visual symbols of twentieth-century technology such as the three identical large domed containment structures near the entry to an area (Hudson Highlands) that is largely nineteenth-century in appearance. Although the plant was designed to present a pleasant and attractive appearance, and the general site plan includes a freshwater lake, a new visitors' center, and a 30-ha (80-acre) woodland recreational facility (AEC Dockets 50-247 and 50-286), these amenities have not proved sufficient to overshadow the plant's perceived intrusion into the area's sense of place and historic character. One source summarizes this situation: "The visual impact affects the historic river communities in a broad sense. You can see the plant from so many areas that it has diminished the historic character of the areas and the aesthetic appeal in general. It definitely intrudes and disturbs the overall sense that one gets from viewing the area."

Archaeological sites at or near the power plant already were disturbed severely before construction of the plant, and the impacts from plant construction and operation here are considered to have been insignificant (AEC Docket 50-247). The National Register of Historic Places (including designated National Historic Landmarks) and the Hudson River Valley Commission's preliminary inventory of historic resources list numerous buildings and sites within several kilometers of Indian Point, but none has been directly affected by the plant's construction (AEC Docket 50-247). Many structures are not listed and are thereby unprotected in any planning processes, but they have considerable historic value nonetheless; many of these may be eligible

for listing but have not undergone the lengthy qualification process. The noticeable impacts have come from the indirect impacts to these and other historic resources. In what may be an isolated anecdotal account, one respondent cited this experience: one homeowner was encouraged to restore a building that had historic value but declined, discounting the building's significance because of its proximity to the plant.

C.4.4.7.2 Predicted Impacts of License Renewal

Refurbishment and relicensing of Indian Point would probably mean a continuation of the persistent negative perception of the plant's effects on aesthetics and historic resources. The relicensing process and the refurbishment activity would likely bring the plant to the public's awareness and provide a gauge of the degree to which the public has become adapted to and accepting of the plant. The plant's continued presence most likely would continue to remind recreationists and other viewers of the presence of this modern technology among the river communities and historic features of the areas, a fact that to this point has been perceived as negative. One informant states that if the Indian Point facility were being proposed now, its proponents would have a "large fight on their hands from the aesthetics point of view."

Potential impacts to historic resources must be determined through consultation with the SHPO.

C.4.5 Oconee

The impact area—the locations where the most pronounced socioeconomic impacts might result from refurbishment and license renewal—for the Oconee Nuclear Station (ONS) consists of Oconee County, South

Carolina. The selection of this area is based on worker residence patterns, employment, expenditures, and tax payments. Figure C.12 depicts the impact area, and Figure C.13 shows the region in which it is located.

C.4.5.1 Population

This section discusses the local population growth associated with the construction, operation, and license renewal of ONS. Section C.4.1 describes the methodology used to project population growth for all plants. Data used to prepare this section were obtained from *Socioeconomic Impacts of Nuclear Generating Stations: Oconee Case Study* (NUREG/CR-2749, vol. 7); *Environmental Assessment Proposed Rule on Nuclear Plant License Renewal* (NUREG-1398); SEA refurbishment work force estimates (Appendix B; SEA 1994); population projections by the State of South Carolina Division of Research and Statistical Services; and Duke Power Company (1990).

The discussion of population growth is organized into two time periods. Section C.4.5.1.1 identifies the population growth that Oconee County has experienced as a result of the construction and operation of ONS from 1967 to 1990. Section C.4.5.1.2 projects the population growth expected to result from ONS's refurbishment period and license renewal term operations beginning in 2013 (Units 1 and 2) based on the growth associated with the plant's initial construction. Also, Section C.4.5.1.2. projects the population growth expected to result from ONS's license renewal term based on the growth associated with operations.

C.4.5.1.1 Growth Resulting from Plant Construction and Operation

ONS's construction resulted in small population increases in Oconee County

ORNL-DWG 95M-6435

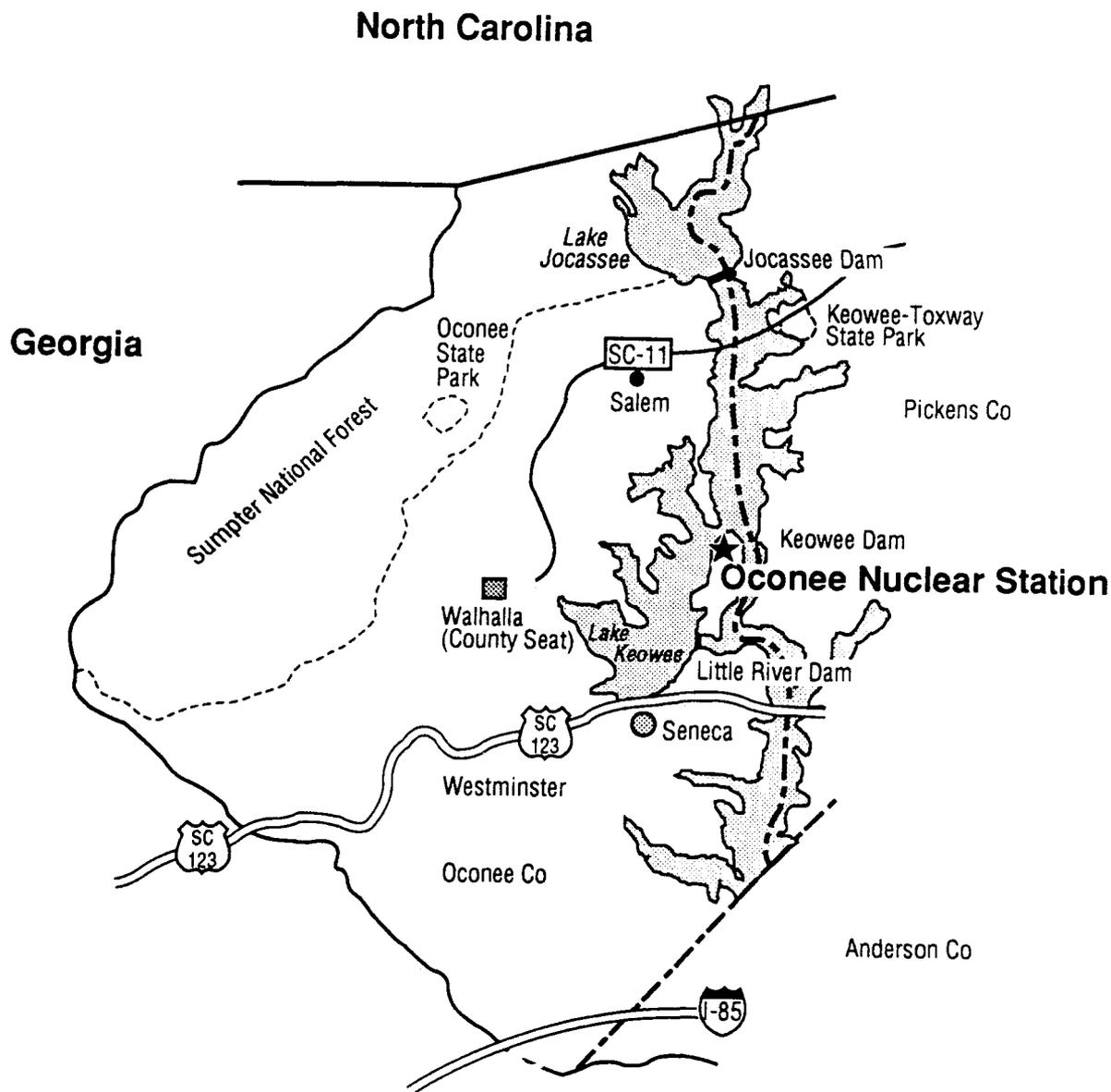


Figure C.12 Socioeconomic impact area associated with Oconee Nuclear Station refurbishment: Oconee County.

ORNL-DWG 90M-14837

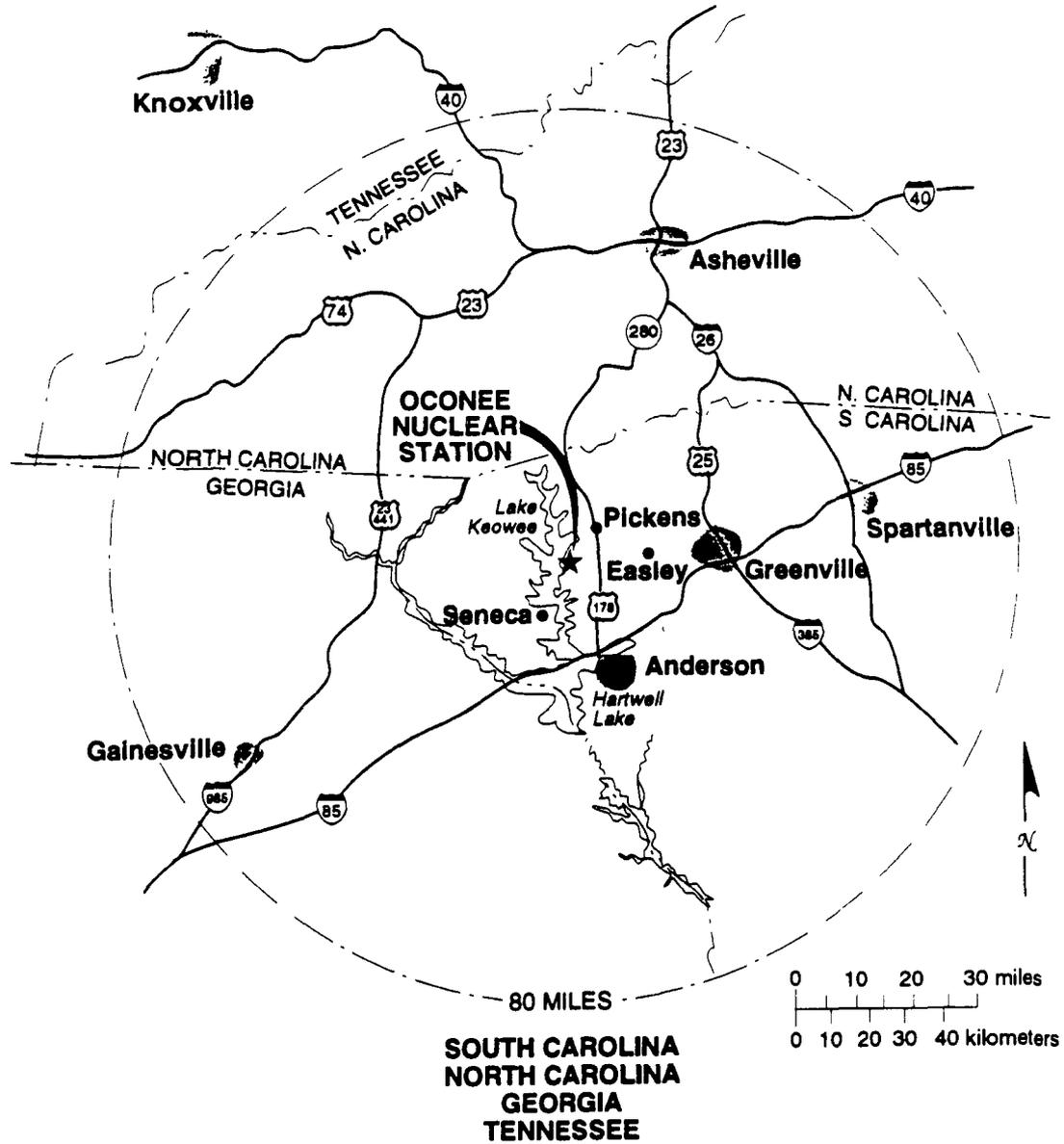


Figure C.13 Region surrounding the Oconee Nuclear Station nuclear plant.

(Table C.60). During the peak construction year, 1971, ONS personnel and their families who migrated to the area to work at the plant, and others who moved into the area to work in jobs generated by the plant's presence, totalled approximately 701 persons. This influx of new residents represented 1.7 percent of Oconee County's total population in 1971 (NUREG/CR-2749, vol. 7, p. 89).

Operations at ONS have resulted in smaller population increases than did the plant's construction. In 1990, 2300 permanent plant staff were on-site at ONS (this figure includes regular plant staff and Duke Power's Construction Department, which was permanently located on-site at ONS in 1985). In past operating years, additional contract workers have been on-site for planned outages, but they have not been included here because their presence at the plant was temporary.

Of the permanent plant staff, 50 percent (1150) reside in Oconee County (Duke Power Company 1990). Based on the residential settlement pattern of ONS's 1975 work force, it is estimated that 83.6 percent (961) of those residing in Oconee County in 1990 were prior residents who obtained jobs and that 16.4 percent (189) were workers who migrated into the area for jobs (Table C.61). Also following the pattern set during plant operations, it is estimated that 77 percent of the in-migrants (146) were accompanied by their families. Assuming the 1990 South Carolina average family size of 3.16 persons, this represents a total in-migration of 504 new residents for the county. Based on the distribution of nonplant jobs created in Oconee County during earlier operating periods, it is estimated that ONS's 1990 operations created an additional 948 indirect jobs in service industries supported by the spending

of Oconee workers. However, it is assumed that no additional residents moved into Oconee County for these indirect jobs, as all additional employment opportunities are expected to have been filled by persons who resided in Oconee County or by long-distance commuters. In all, an estimated 504 new residents moved into Oconee County as a result of ONS's 1990 operations (Table C.61). These new residents made up about 0.9 percent of Oconee County's 1990 population of 57,494 (NUREG/CR-2749, vol. 7, pp. 65-87; MacFarlane 1990).

C.4.5.1.2 Predicted Growth Resulting from License Renewal

As discussed in Section C.3.1, ONS's license renewal would require the completion of a number of refurbishment tasks for Units 1, 2, and 3. Many of the refurbishment tasks are expected to be completed during scheduled refueling outages at each unit during the 10 years that precede the expiration of the initial operating license. However, the final refurbishment work is expected to be completed during one large refurbishment outage scheduled for each unit a year or two before the initial operating license expires. Because the final refurbishment outage would involve more workers on-site over a longer period of time than any of the preceding refueling outages, it represents the peak refurbishment period. For other assumptions concerning the refurbishment work force, refer to Sections C.3.1 and C.4.1.1.2.

Assuming the refurbishment schedule described in Section C.3.1, the peak refurbishment years for ONS Units 1 and 2 would probably be 2011 and/or 2012, and the peak refurbishment year for ONS Unit 3 is expected to be 2013. For each unit, the on-site refurbishment work force would be about the same size and would be on-site for

approximately the same period of time (refer to Section 6.4.1.1.2 for other work force assumptions). However, because uncertainties exist concerning the length of the outage and the size of the work force required to complete the refurbishment of a given unit, this section examines a bounding case work force scenario as described in Section C.3.1.

Given the work force scenario detailed in Section C.3.1, it is estimated that 2273 workers would be on-site to complete refurbishment of ONS Units 1 and 2 in 2011 or 2012 and Unit 3 in 2013 (SEA 1994). Further, assuming that the residential distribution of refurbishment workers would be similar to that of the 1971 ONS construction work force, it is estimated that 25.4 percent (577) would reside in Oconee County. Based on plant construction experience, it is projected that 50 percent (230) of those residing in Oconee County would be prior residents who obtain refurbishment jobs, and 289 would be workers who migrate into the area for refurbishment jobs (Table C.62). Also following the pattern set during plant construction, 33.3 percent of the in-migrants (96) would be accompanied by families. Using the South Carolina average family size of 3.16 persons, total refurbishment worker in-migration would result in 496 new residents for the county. Based on the ratio of plant to nonplant jobs created in Oconee County in 1971, ONS's refurbishment is projected to create an additional 118 indirect jobs in service industries supported by the spending of ONS refurbishment workers (Table C.62). However, no additional residents are expected to move into Oconee County for these indirect jobs, as all additional employment opportunities would be filled by persons who already reside in the county or by long-distance commuters. In all, approximately 496 new residents

would be expected to move into Oconee County as a result of ONS's refurbishment under the work force scenario. That would represent 0.7 percent of Oconee County's projected population of 73,542 in 2013 (NUREG/CR-2749, vol. 7, pp. 62-86).

Once plant refurbishment is completed for ONS Units 1, 2, and 3, the work force would consist mostly of permanent plant staff. Additional refurbishment/refueling workers would be temporarily on-site approximately every 2 years, but they would not be permanent, on-site plant staff, and many of them are expected to commute from outside the study area. It is expected that a maximum of 60 additional permanent workers per unit would be required during the license renewal term, adding 180 workers to ONS's existing work force. Assuming that the new workers' residential distribution would be the same as that of current plant staff, approximately 50 percent (90) would reside in Oconee County. Based on worker in-migration in 1975, it is expected that 83.6 percent (75) of those residing in Oconee County would be prior residents who obtain jobs and 16.4 percent (15) would be workers who migrate into the area for jobs (Table C.63). Also following the pattern set during plant operations, 77 percent of the in-migrants (12) would be accompanied by their families. Using the South Carolina average family size of 3.16 people, total in-migration would result in 41 new residents for the county. Based on the ratio of plant to nonplant jobs created in Oconee County in 1975, ONS's license renewal term is projected to create an additional 74 indirect jobs in service industries supported by the spending of ONS workers (Table C.63). However, no additional residents would be moving into Oconee County as a result of these indirect jobs, as they are expected to be filled by county residents and commuters. In all,

approximately 41 new residents would be expected to move into Oconee County as a result of ONS's license renewal term. That would represent less than 0.1 percent of Oconee County's projected population in 2013 (NUREG/CR-2749, vol. 7, pp. 62–86).

C.4.5.2 Housing

The following sections examine the housing impacts that occurred in Oconee County during construction and operation of ONS and predict housing impacts that would result from refurbishment activities and continued operation. Possible impacts to housing include changes in the number of housing units, particularly the rate of growth of the housing stock; changes in occupancy rates; changes in the characteristics of the housing stock; and changes in rental rates or property values.

Section C.4.1.2 includes a complete discussion of the methodology and assumptions used to predict housing impacts.

C.4.5.2.1 Impacts from Plant Construction and Operation

The following discussion begins with a description of project-related housing demand in Oconee County. A discussion of the housing market at the time of ONS construction and changes that occurred in the housing market follows. Finally, impacts from the operation of ONS are assessed.

Project-related population increase and commensurate demand for housing in Oconee County peaked in 1971, when the average annual employment at ONS reached 2342. Project-related population increase in Oconee County was 701 persons (including family), while off-site housing demand reached 167 units (NUREG/CR-2749, vol. 7). Population increase was kept low

because of Duke's local hiring policy. Also, Duke Power provided on-site "bachelor's quarters" accommodating 150 workers. Thus, project-related demand for housing was quite low relative to the peak number of employees. Project-related demand at its peak in 1971 accounted for 1.2 percent of the 1970 Oconee County year-round housing stock.

The 1970 Census reported a 3.0 percent vacancy rate, or 411 vacancies, either for sale or rent in Oconee County (U.S. Bureau of the Census 1972). These vacancies existed despite a project-related demand for 85 units in 1965 and 145 units in 1970. These vacancies, together with continued expansion of the housing stock in 1970 and 1971 and the proximity of the metropolitan areas of Greenville and Anderson, were adequate in meeting project-related demand.

Changes in the housing stock experienced during construction include an increase in the number of multifamily units and the number of mobile homes. In the intercensal period 1970–80, a net increase of 315 multifamily units occurred in Oconee County (U.S. Bureau of the Census 1972, 1982). This was a 41.2 percent increase over the 1970 multifamily stock. The most significant change was the addition of structures with four or more units. The period of quickest growth in this housing type occurred between 1971 and 1974, when 248 multifamily units were built in Oconee County (NUREG/CR-2749, vol. 7). The number of mobile homes in Oconee County doubled in the intercensal 1970–80 period, so that by 1980 there were 2881 mobile homes (U.S. Bureau of the Census 1972, 1982).

The median monthly rental rates in Oconee County were \$37 in 1960, \$36 in 1970, and \$90 in 1980. The median rental rates in

South Carolina for the same years were \$32, \$50, and \$130. Rental rates in Oconee County increased at a slower rate than those in the state of South Carolina despite the addition of numerous new multifamily units in Oconee County. Local perception is that the rental rate of nonsubsidized units, which ranged between \$120 and \$250 per month in 1979, increased beyond inflation-induced effects because of the increased demand for housing and because in-migrants had incomes larger than local residents (NUREG/CR-2749, vol. 7).

In summary, housing in Oconee County adequately met project-related demand, and little change in housing characteristics or value resulted because of project-related demand. Construction-related impacts on housing were insignificant.

The operation of ONS has had only insignificant impacts on housing. Lake Keowee has attracted substantial residential development; however, the plant itself has had no substantial effect on development. Occasionally, a new home is built for operation workers. The values of properties in the vicinity of the plant have not been negatively affected by its operation.

C.4.5.2.2 Predicted Impacts of License Renewal

Project-related population increase and the commensurate housing demand would be the cause of new housing impacts during refurbishment activities. This section summarizes recent and anticipated growth in housing and estimates possible housing impacts during refurbishment and the license renewal term.

Between 1970 and 1980, the number of housing units in Oconee County increased 44 percent above the 1970 housing stock

(U.S. Bureau of Census 1972, 1982). Residential development occurred primarily along the Keowee Lake. The rate of growth slowed somewhat during the 1980s, so that the 1980 housing stock increased by 28.5 percent between 1980 and 1990. If the rate of growth experienced in the 1980s continues through 2010, shortly before the peak refurbishment year, there will be 42,900 housing units in Oconee County. The projected population of Oconee County in 2013 is 73,542 and will require 28,840 housing units. Although adjustment in housing growth will be made according to population growth, the current rate of growth suggests that there will be available housing in Oconee County during refurbishment activities.

According to the estimate of the number of workers required for refurbishment activities and based on plant construction experience, 289 workers of the total work force of 2273 are expected to migrate to Oconee County for refurbishment jobs. Of these in-migrants, 96 would be accompanied by families. Some doubling-up is expected to occur among the remaining 193 in-migrants, so that each mover would require 0.85 housing unit. Worker migration to Oconee County would result in a total project-related housing demand in the peak year of refurbishment of 260 housing units.

Refurbishment-related housing demand is greater than the construction-related housing demand of 167 units, but the number of housing units in Oconee County will have increased 200 percent between construction and refurbishment periods. Housing demand would account for about 0.6 percent of the possible 42,900 housing units in Oconee County during refurbishment. Because demand in the bounding case scenario would be so small relative to the existing housing market and

because impacts would be even less than those experienced during plant construction, refurbishment-related housing demand is expected to have only small new impacts on the Oconee County housing market.

Housing impacts related to housing value and marketability that would occur during the license renewal term are the same as those currently being experienced (Section C.4.5.2.1). The 180 additional workers (60 per unit) required during the license renewal and the commensurate housing demand would cause only small new housing impacts.

C.4.5.3 Taxes

C.4.5.3.1 Impacts from Plant Construction and Operation

Oconee County is the only political jurisdiction that taxes ONS. Besides collecting taxes for its own use, the county collects property tax levies for the Oconee School District. The state of South Carolina appraises electric utility property, including ONS, using the unit valuation method. This method assigns a value to the licensee's power plant based on the historical cost of assets less depreciation; capitalization of a future income stream over a 3-year period; and stock value and debt approach over a 3-year period. After exemptions for nontaxable assets, the value is apportioned to the local jurisdiction by gross investment. Much of the information used in the appraisal is from Federal Regulatory Commission Form 1, which is public information. The appraised value is multiplied by 10.5 percent to calculate the assessed value that the county uses to apply tax rates.

The power plant has been an important source of revenue for Oconee County

(Table C.64). The county received about \$7.6 million in taxes from the licensee in 1975 (constant 1989 dollars) and about \$6.6 million in 1989. In 1975, property tax from the licensee accounted for about 50 percent of property taxes in the county and about 25 percent of total revenue. Oconee County's assessments increased from \$111 million in 1975 to approximately \$173 million in 1989, with the licensee's contribution in terms of total tax revenues falling from 50.1 percent to 29.1 percent, still demonstrating a heavy reliance by the county on the power plant. In the same time period, the power plant's portion of total county revenue fell from nearly 25 percent to 14.2 percent.

The Oconee School District has had strongly increasing revenues from state and local sources. In 1981, total revenues were approximately \$20.2 million (1989 dollars). By 1989, total revenues were approximately \$32.8 million. The contribution to school district taxes from the licensee increased from about \$3.5 million to \$4.6 million from 1981 to 1989. While this was a declining percentage of the total Oconee School District revenues (from 18 percent to 14 percent over this period), the power plant still had a moderate impact.

The overall trend has been a decline in the importance of ONS as a direct, primary source of revenues and taxes. This trend has been the result of strong economic growth in Oconee County and the much higher county property assessments that ensued. Also, Oconee School District revenues have sharply increased, partly as the result of state programs promoting improved education.

The tax effects of the power plant have been quite favorable to the local school district. For instance, in the 1987-88 school

year, Oconee School District ranked 10th out of the 91 school districts in South Carolina in assessed value per pupil. The Oconee School District ranked 82nd out of 91 school districts in its tax effort, yet it ranked 57th in revenue received per pupil, 26th for local taxes per pupil for current operations, and 13th in per pupil expenditures for capital outlay. Thus, while having a relatively low taxation rate, the property tax base in Oconee County allowed Oconee School District to maintain its schools at respectable expenditure levels. During this period, the assessed valuation per pupil was about twice the median for all school districts in the state (Hill 1989).

An earlier study of Oconee indicated that county employment and capital expenditures increased dramatically, with large increases in tax revenues associated with the power plant (NUREG/CR-2749, vol. 7). This trend seems to have contributed to economic growth in Oconee County. The Oconee County auditor indicated that high-technology industry had been moving into Oconee, a trend attributable to the man-made lakes associated with the power plant and the water and sewer systems installed in the mid-1980s. The increase in property tax revenue from the power plant made many of the improvements in infrastructure possible without correspondingly large increases in the tax rate.

C.4.5.3.2 Predicted Impacts of License Renewal

During refurbishment of ONS, a new tax-related impact is expected to occur. This new impact involves increases in tax payments that would result from capital improvements during the current term outages. Tax increases resulting from improvements made in the final

refurbishment outage would affect taxes only during the license renewal term. The magnitude of the impact depends on Duke Power's decision about which improvements would occur early on and which would be done during the final outage. For example, if the steam generator is replaced during a current term outage, the assessed value may increase considerably before the license renewal term begins. If steam generator replacement and other major capital improvements are not undertaken early on, the increase in assessed valuation may be only minor. The increase, in either case, is expected to cause only a small to moderate new tax impact.

During the license renewal term, the primary tax-related impact would be the continuation of tax payments that ONS is currently making to Oconee County and the Oconee School District. A new impact also would result from the increase in tax payments resulting from improvements made at Oconee during the final refurbishment period. Thus, tax revenues would increase in absolute terms, although they may not provide a proportionally larger share of the total revenues of either taxing jurisdiction. This is especially true because currently the tax base in Oconee County is increasing rapidly. This trend was expected to continue with the addition in 1992 of the Bad Creek Pumped Storage Hydro Power Facility. The increase in assessed valuation of ONS after refurbishment may offset this trend so that ONS tax revenues—continuing and additional payments combined—would continue to make up a substantial share of the total revenues. The moderate tax-related impact currently being experienced in the school district and the county would continue during the license renewal term.

C.4.5.4 Public Services

C.4.5.4.1 Impacts from Plant Construction and Operation

Municipalities in the Oconee study area have a council-mayor form of government that provides both legislative and executive supervision of municipal services such as water, sewers, roads, fire, police, and recreation. The majority of services are provided for at a county or state level (NUREG/CR-2749, vol. 7, p. 105). Before 1975, when the county-council form of government was established, the Oconee County government was run by local delegates, with daily activities being the responsibility of a board of county commissioners. Although it is not known if the change to county-council government was directly related to the plant, the change provided significant local control of county services. During the period immediately after operations began (1978), the scope and type of county services were expanded and a number of new departments were created. Several new programs were added, and existing ones were upgraded, particularly public safety, social services, and educational institutions (NUREG/CR-2749, vol. 7, p. 113). Information pertaining to expenditures is discussed in detail in Section C.4.5.1.

Education

Public education in Oconee County is provided by one school district that serves the whole county. Before 1966 (preconstruction phase), the county operated two school systems, one for the black population and another for the white population. Desegregation began after 1967, and by 1969, total integration of the schools was achieved (NUREG/CR-2749, vol. 7, p. 114).

The overall change in enrollment throughout the 1970s was relatively small, never falling below 10,000 students. Oconee County schools have consistently had a better pupil/teacher ratio than the state. The ratio dropped from 22 to 1 in 1966 to 19.52 to 1 in 1981. During the mid-1970s, and coinciding with Duke tax payments on ONS and changes in the form of county government, school expenditures increased significantly (NUREG/CR-2749, vol. 7, p. 117).

The data on enrollments do not show any significant increases that could be associated with ONS's employment patterns. This was because daily commuters made up almost 75 percent of the peak construction work force and approximately half the operations work force; these workers created no new demand for local services. The total number of children of workers who moved into the county to take project-related jobs was not more than 140 students during plant construction in 1971 (1.4 percent of total enrollment) and 43 students during plant operations in 1978 (0.5 percent of total enrollment) (NUREG/CR-2749, vol. 7, p. 118).

The superintendent of education in Oconee County indicated that the power plant, along with many other industries, has had an impact on the educational system. He also stated that Duke Power is very supportive of all local efforts to improve schools and education in general. The operation of ONS did not put an immediate demand on education but, rather, had an impact over the long term. Local officials stated that Oconee County was previously a textile/agricultural area. This has changed over time. Industry today (the nuclear industry included) is more high-tech; therefore, the educational system has

changed to meet the demand for technological skills.

Transportation

Oconee County is responsible for maintaining the primary and secondary road system under its jurisdiction. Money for the upkeep of local roads is provided through state and local contributions. Between 1970 and 1980, expenditures on the roads increased fourfold. However, there is no indication that this increase was directly related to the plant construction. During construction of the Keowee-Toxaway Project, Duke Power Company spent \$5 million on relocating 34.6 km (21.5 miles) of roads. One of these roads was Oconee County Highway 183, which, upon relocation, ran directly past the proposed site for the ONS. Local officials gave no indication of major transportation problems stemming from the construction or operation of ONS (NUREG/CR-2749, vol. 7, p. 121).

Public Safety

Public safety expenditures increased steadily from 1967 to 1980, increasing from \$107,500 to \$954,200 per year. There were substantial improvements in police protection and fire-fighting equipment during this period. Expenditures from the budget were made primarily to purchase new police cars and fire equipment. Other large outlays were also made on repairs to the jail (NUREG/CR-2749, vol. 7, p. 113). Oconee County has an elected sheriff and 30 full-time paid deputies. The county has a rural volunteer fire department, and some municipalities also have their own fire departments with paid firefighters. The town of Seneca recently purchased an aerial ladder truck for \$500,000, which was funded from tax dollars.

The emergency preparedness center for Oconee County is supported through federal and county tax revenues. According to the local director for emergency preparedness, the construction phase had a minor impact on the demand for emergency services. The operations phase has had more of an impact in terms of all types of increases in the center's workload, ranging from additional paperwork to additional training. As far as refurbishment and refueling activities are concerned, the indication from the director was that there was more awareness of the potential for a nuclear accident throughout the county after the Three Mile Island accident.

Social Services

In 1967, social services in Oconee County consisted primarily of public assistance and food stamps. Little expansion in services occurred during the plant construction period. Beginning in 1974 (when construction was completed) several additional services were offered by the county. This coincided with a large increase in local tax revenues. Since then county expenditures in social services have remained fairly constant. According to the Department of Social Services in Walhalla, the construction phase had a definite impact on the demand for services, but the operations phase has had no impact on the level of services provided.

Public Utilities

Public utilities (water, sewer, electricity) in Oconee County increased from 0.5 percent of the budget in 1967 to 2.6 percent of the budget in 1980. Expenditures in the budget allowed for a countywide solid waste disposal capability in 1973 (NUREG/CR-2749, vol. 7, p. 113). An increased level of public services was provided, while the tax rates declined

somewhat as a result of ONS's significant contribution to county revenues. The plant construction phase had an impact on the public utilities system, specifically water consumption; and the operation phase caused an increase in the demand for water and sewer services. Officials gave no indication that this demand was a burden on the utilities.

Tourism and Recreation

Local leaders interviewed indicated no adverse impacts from the construction or operation of the ONS. On the contrary, most people interviewed said that the plant has been an asset and that "water-related activities have increased since the plant moved in" because of the large cooling lake constructed for the plant. The town of Seneca recently completed a multimillion-dollar sports facility. A planner with the Community Development Department in Seneca thought the in-migration of executives associated with the plant increased use of recreation facilities and caused an upgrade in the quality of recreation in the area.

Duke Power operates a visitor's center, the World of Energy, which provides information about energy development and what is going on in the Oconee area in regard to energy. One local official indicated that, although there may be no tangible or visible impacts from the plant, it "has a positive effect on tourism; people visit the area and then go and tour the plant."

C.4.5.4.2 Predicted Impacts of License Renewal

Based on the estimated 2273 direct workers required during peak refurbishment, the staff estimates that 96 direct workers and no indirect workers will migrate with their

families to Oconee County (Section C.4.5.1.2). The number of children accompanying these workers is estimated using the South Carolina average family size (3.16) and assuming that all families include two adults. Children are expected to be evenly distributed in age from ≤ 1 to 18 years. Assuming that 72.2 percent of these children are school age (5 to 18 years), there will be an average of 0.84 school-age children per in-migrating family, or a total of 81 new students in Oconee County. This represents a < 1.0 percent increase above the projected number of school-age children in Oconee County in 2013 (assuming the 1990 age distribution of the population). This slight increase will result in only small impacts to education.

During peak construction at ONS in 1971, approximately 701 persons moved into the area. These 701 persons accounted for only 1.7 percent of Oconee County's population in 1971 (Section C.4.5.1.1). During the construction of ONS, impacts on transportation, tourism, and recreation were small. Public safety and social services both increased in terms of financial improvements during the construction phase.

Peak refurbishment activities will bring 496 in-migrants to Oconee County. This population is smaller than the construction-related in-migrating population and represents a < 1 percent increase in Oconee's projected population in 2013. The operations related in-migration is projected to be 41 persons. Adverse impacts, if any, to public services will be small during refurbishment and license renewal term operations. The positive effects on recreation will continue.

C.4.5.5 Off-Site Land Use

This section describes the off-site land use impacts of the construction, operation, and license renewal of ONS. The discussion of impacts is primarily concerned with land use in the immediate vicinity of the plant, but impacts for Oconee County are described where appropriate. Land-use impacts are examined for two time periods. First, Section C.4.5.5.1 identifies the land-use impacts of ONS's construction as part of Duke Power Company's larger Keowee-Toxaway Project. Section C.4.5.5.1 also describes the land-use impacts of ONS's operation as an entity separate from the Keowee-Toxaway Project. Next, Section C.4.5.5.2 projects the land-use impacts of ONS's refurbishment period based on the impacts that occurred during the plant's construction. Also, Section C.4.5.5.2 projects the land-use impacts of the plant's license renewal term based on the impacts that have occurred during operations. Information sources for this report include the *Final Environmental Statement Related to the Operation of Oconee Nuclear Station, Units 1, 2, and 3* (AEC Dockets 50-269, 50-270, and 50-287); *Socioeconomic Impacts of Nuclear Generating Stations: Oconee Case Study* (NUREG/CR-2749, vol. 7); and interviews with key information sources in Oconee County. Section C.4.1.5 describes the methods used to assess and project land-use impacts for all case study plants.

C.4.5.5.1 Impacts from Plant Construction and Operation

ONS is located on a 206-ha (510-acre) site on Lake Keowee near Seneca. The nuclear plant was built as part of Duke Power Company's Keowee-Toxaway Project. ONS's construction, which began in 1967, was integrated with the impoundment of Lake

Keowee (and the construction of Duke's hydroelectric plant) and the impoundment of Lake Jocassee (and the construction of Duke's pumped-storage facility). Because Lake Keowee and Lake Jocassee are integral to ONS's role in the Keowee-Toxaway Project, the impacts of their impoundment are considered as part of the land-use impacts of the nuclear plant's construction.

Together, the ONS site, Lake Keowee, and Lake Jocassee cover more than 10,700 ha (26,500 acres) of the 63,500 ha (157,000 acres) Duke Power purchased for the Keowee-Toxaway Project. Most of the land that Duke Power acquired was woodland, and the remainder (about 10 percent) had previously been used as marginal farmland and pasture land. No commercial or industrial development was on the property; however, there were over 300 rural residences and cabins, and nearly 900 residents (AEC Dockets 50-269, 50-270, and 50-287).

ONS's construction—and more specifically the impoundment of Lakes Keowee and Jocassee—had significant direct land-use impacts on Oconee County. The Keowee-Toxaway Project land purchase made the Crescent Land and Timber Company (a Duke Power subsidiary) the largest single private land owner in Oconee County. All of the residents on the Duke property were relocated, and all of the structures and much of the timber were removed from the plant site and from the areas that were to be inundated. Oconee County's road system underwent extensive change because of the project, as more than 34.6 km (21.5 miles) of road (including six major bridges) were constructed between 1967 and 1970 to compensate for the effects of the lakes' presence on the regional transportation network (AEC Dockets

50-269, 50-270, and 50-287; NUREG/CR-2749, vol. 7).

Lake Keowee and Lake Jocassee continued to have significant land-use impacts in Oconee County after their impoundment. Since the late 1960s, the lakes (especially Keowee) have become the focal point for Oconee County's residential and recreational land uses. The southern end of Lake Keowee, near Seneca, has attracted a great deal of the new residential development in the county. Much of the growth that has occurred in that area consists of very expensive resort-type homes and condominiums. Because of the area's climate, beauty, and recreational amenities, many of the developments on Lake Keowee have been targeted towards wealthy in-migrants, especially retirees. Keowee Keys—a retirement community that features private homes and condominiums, a marina, tennis courts, a country club, and a golf course—has some of the more expensive homes in the county. It also has been the most successful of the higher-priced developments on Lake Keowee, despite the fact that it is the residential area closest to the nuclear plant. Key informants indicated that the lakes' impoundment also had positive indirect impacts on residential development patterns in Oconee County. One of the important indirect effects results from the property tax payments that have been generated by the expensive developments on Lake Keowee. It is believed that the influx of new property tax revenues has allowed the municipalities within the county to extend their provision of public services (NUREG/CR-2749, vol. 7).

In terms of recreational land uses, much of the lakeshore property has been developed (either privately or by Duke Power) with campgrounds, boat launch areas, marinas,

golf courses, and small retail establishments. Further development for recreational use has resulted from Duke Power's decision to deed much of its original land purchase to the state of South Carolina. The utility donated 400 ha (1000 acres) for the Keowee-Toxaway State Park, over 40,000 ha (100,000 acres) to the South Carolina Wildlife Resources Commission, and, more recently, 200 ha (500 acres) for Devil's Fork State Park. In general, key informants felt that the lakes were a very positive force in guiding recreational land use in Oconee County (NUREG/CR-2749, vol. 7).

ONS's operation, considered here separately from the existence of Lake Keowee and Lake Jocassee, has had moderate direct and indirect land-use impacts on Oconee County. According to key sources, the Oconee Station's presence has not been a deterrent to residential land use. Keowee Keys is the closest residential development to the plant, and it has been successful in sales, despite its relatively expensive property and housing costs and the nuclear plant's close proximity. Also, informants indicated that ONS's property tax contributions have enabled the local governments to expand their public services while lowering property tax rates and that this has helped guide residential, commercial, and industrial land-use and development patterns in other parts of the county.

The plant's presence has had a positive effect on recruiting industries, but many felt that it did not have as large an effect on industrial development as it has on residential and recreational land uses. Most of the county's industrial development has occurred in the 15-km (9-mile) triangle between Seneca, Walhalla, and West Minster. This is because the county has installed the infrastructure necessary for industrial development (particularly sewer

and water lines) in the area, and because the county's wastewater treatment facilities are located in the three towns that form the triangle. In terms of industrial recruitment, it was believed that companies who were interested in locating in Oconee County saw ONS (and the whole Keowee-Toxaway Project) as a stabilizing influence on the regional economy and as a reliable source of electric power. Sources felt that with the combination of a stable economy, a reliable power source, relatively low property tax rates, and the installation of infrastructure industries needed, Oconee County had been able to attract a number of desirable industries in the past two decades. These attractive benefits are mainly because of ONS and the Keowee-Toxaway Project. Overall, respondents felt that ONS's operation, in terms of the benefits that the station provides, has had positive impacts on land-use and development patterns in Oconee County.

C.4.5.5.2 Predicted Impacts of License Renewal

The direct land-use impacts of ONS's refurbishment and license renewal term on property in the immediate vicinity of the plant and on Oconee County are expected to be small. Using the bounding case work-force scenario, refurbishment-related population growth is projected to represent approximately 0.7 percent of Oconee County's projected population in 2013. Population growth associated with the license renewal term is projected to account for less than 0.1 percent of the county's projected 2013 population. Such small increases during refurbishment and the license renewal term are likely to have minimal new impacts in terms of residential development patterns.

As in the past, the plant itself is not expected to attract or discourage new residential development directly. Sources agree that residential construction, particularly of higher-priced resort and retirement communities, would continue on Lake Keowee despite ONS's presence because of the amenities the lake offers. Also, it is likely that recreational land uses would continue to flourish near Lake Keowee because recreation and tourism play a big role in Oconee County's overall economic development picture. In general, however, the direct land-use impacts of ONS's refurbishment and license renewal term would be small.

In terms of land use, the new indirect impacts of ONS's license renewal term are expected to be moderate. The effects of license renewal would probably be greater than the direct impacts of the plant's refurbishment and comparable to the indirect impacts of operations under the original 40-year license. ONS's property tax contributions would continue to help local governments improve and expand their municipal services, further defining the county's residential, commercial, and industrial land-use and development pattern. Residential land use is expected to continue north of Seneca near Lake Keowee as sewer and water lines are extended beyond the city's boundaries. Industrial and commercial growth is expected to continue along Highway 123 in the triangle between Seneca, Walhalla, and West Minster. Because ONS helps promote the region's economic stability, provides a reliable source of power, and allows the county to lower property tax rates while expanding services, it also would continue to be an asset in recruiting industries to the area. Overall, the new indirect land use impacts of ONS's license renewal term are likely to be similar to the

impacts that the plant has had during operations thus far.

C.4.5.6 Economic Structure

C.4.5.6.1 Impacts from Plant Construction and Operation

The construction and operation of ONS have resulted in insignificant and noticeable impacts, respectively, on Oconee County. The plant has directly increased employment and income for residents of the county engaged in its construction and operation. Also, direct employment and income have resulted in indirect employment and income, and the plant's tax payments have helped provide the infrastructure for attracting business into the county.

Table C.65 presents the estimated employment and expenditure effects of ONS for residents of Oconee County. In 1971, construction activity was at a peak, and by 1978 the plant was in full operation. However, total employment related to the plant almost tripled between 1978 and 1989. Thus, the economic impact from employment and income generated by ONS has increased over time, as the percentages of county employment and income provided by the plant have become greater.

C.4.5.6.2 Predicted Impacts of License Renewal

The main impact of license renewal at ONS would be the continued employment benefits of the plant's operation. The size of the benefits should be similar to those that existed in 1989, but the relative importance of the benefits is expected to decline as Oconee County's economy is projected to grow in other sectors.

The work force scenario detailed in Section C.3.1 was used to estimate the employment effects of refurbishment at ONS. Table C.66 shows the total direct and indirect plant-related employment of Oconee County residents during refurbishment. It is projected that ONS would employ 577 Oconee County residents as refurbishment workers in 2012 (Section C.4.5.1.2). Indirect employment that would result from purchases of goods and services during refurbishment is projected to create 118 jobs for Oconee County residents. Total refurbishment-related direct and indirect employment, therefore, is expected to be 695 in 2012. This represents 1.9 percent of the county's projected 2012 total employment, resulting in small impacts.

Relatively few new plant-related jobs would be created at ONS during the license renewal term. Nearly all plant-related employment (and associated impacts) expected during that time period would represent a continuation of employment (and impacts) from past operations. Table C.67 shows the impact of the increased labor requirements at ONS during the license renewal term.

The license renewal term work force for ONS would require an estimated 180 additional employees (Section C.4.5.1.2). Of the additional workers, 90 are projected to be Oconee County residents. An estimated 74 indirect jobs would also be created for county residents during the license renewal term. With the continued effects of the plant's current employment and the additional employment to be created, total direct and indirect license renewal term employment of Oconee County residents is projected to be 1314, or 3.6 percent of Oconee County's projected employment in 2013. This represents a small impact.

C.4.5.7 Historic and Aesthetic Resources

This section describes the impacts that the construction and operation of ONS Units 1, 2, and 3 have had on historic and aesthetic resources and projects the expected impacts of the station's refurbishment and postlicensing operations. Information sources include the *Final Environmental Statement Related to the Operation of Oconee Nuclear Station, Units 1, 2, and 3* (AEC Dockets 50-269, 50-270, and 50-287) and interviews with key individuals in Oconee County and Pickens County, South Carolina.

C.4.5.7.1 Impacts from Plant Construction and Operation

Lake Keowee, with 7490 ha (18,500 acres) and 480 km (300 miles) of shoreline, was created from 1968 to 1971 by the licensee to serve the cooling requirements of ONS, with ancillary use as a hydroelectric power facility, a site for fish propagation, and a recreation and sports facility. The lake covers a land area that formerly included the site of Old Fort Prince George (an early British outpost) and the site of old Keowee town (headquarters of the lower Cherokee Nation). Before the impoundment of the lake, extensive archaeological diggings were made at these two sites (AEC Dockets 50-269, 50-270, and 50-287). Artifacts found are now in the possession of state and local museums. While funds were made available for more site investigations, archaeologists were unable to complete all studies of the historic and prehistoric resources before the area was inundated. Some unexplored resources were lost. All graves and cemeteries in the areas inundated by the lake were moved to new locations, as was a covered bridge that crossed the Keowee River. The licensee also moved the Alexander Hill House (an early-nineteenth-century structure) from its

original site, which would have been right below the new dam, to a county park on Lake Keowee. No properties other than these were listed on the National Register of Historic Places. The state liaison officer for historic preservation had no comment on the construction and operation of the nuclear power plant.

One source believes that the aesthetic impacts from construction and operation of the power plant are more positive than negative. The licensee has developed Keowee Keys, an upscale retirement community on the new Lake Keowee, the Foothills Hiking Trail [a 130-km (80-mile) national trail], the new Devil's Fork State Park, the Keowee-Toxaway State Park, and the World of Energy visitor's center at the nuclear power plant. The source believes that the area looks better since construction of the lakes and that the development of the new residential communities has given a positive image to an area that previously was characterized by low-productivity farms and small woodlots in a rural hilly area of the Piedmont Crescent where the southern Blue Ridge Mountains join the Piedmont.

C.4.5.7.2 Predicted Impacts of License Renewal

The impacts of refurbishment of the Oconee power plant on local historic and aesthetic resources are projected to be much less than those experienced during the original construction of the plant. Original construction involved inundation of 7,000 ha (17,000 acres) of land and conversion of rural, low-intensity agricultural lands to residential and recreational uses. Some historic and prehistoric resources were lost or at least relocated from their original landscape settings during the flooding for development of Lake Keowee. None of these impacts would recur with

refurbishment. Such land conversion and land-use change are not expected to result from refurbishment or license renewal term operations. The impacts of post-relicensing operations are likely to be a continuation of the small impacts experienced during the original operating period. However, determination of impacts to historic resources must be made through consultation with the SHPO.

C.4.6 Three Mile Island

The impact area—the area in which the most pronounced socioeconomic impacts might result from refurbishment and license renewal—at Three Mile Island (TMI), consists of Londonderry Township and the boroughs of Middletown and Royalton in Dauphin County, Pennsylvania. The selection of this area is based on worker residence patterns, employment, expenditures, and tax payments. Figure C.14 depicts the impact area, and Figure C.15 shows the region in which it is located.

C.4.6.1 Population

This section discusses the local population growth associated with the construction, operation, and license renewal of TMI. Dauphin County was not chosen as part of the study area because plant-related growth has had little effect on the county's total population relative to the plant's effect in the local jurisdictions. Section C.4.1 describes the methodology used to project population growth for all plants. Data used to prepare this section were obtained from *Socioeconomic Impacts of Nuclear Generating Stations: Three Mile Island Case Study* (NUREG/CR-2749, vol. 12); *Environmental Assessment for Proposed Rule on Nuclear Power Plant License Renewal* (NUREG-1398), SEA refurbishment work force estimates (Appendix B; SEA 1994),

population projections by the Pennsylvania State Data Center (1990); and the General Public Utilities Corporation (GPU 1990).

The discussion of population growth is organized into two time periods. Section C.4.6.1.1 identifies the population growth that the study area has experienced as a result of the construction and operation of TMI from 1968 to 1990. Section C.4.6.1.2 projects the population growth expected to result from the refurbishment period and license renewal term operations of TMI Unit 1 beginning in 2014, based on the growth associated with the plant's initial construction. Also, Section C.4.6.1.2 projects the population growth expected to result from TMI's license renewal term, based on the growth associated with operations in the past.

C.4.6.1.1 Growth Resulting from Plant Construction and Operation

TMI's construction resulted in noticeable population increases in Londonderry Township, Middletown, and Royalton (Table C.68). During the peak construction year, 1972, TMI personnel and their families who migrated to the area to work at the plant, and others who moved into the area to work in jobs generated by the plant's presence, totalled approximately 310 persons. This influx of new residents represented 2.2 percent of the study area's total population in 1972.

Operations at TMI have resulted in smaller population increases than did the plant's construction. In 1990, 1086 permanent plant staff were on-site at TMI (additional contract workers have been on-site during outages, but they have not been included because their presence at the plant was temporary). Of the permanent plant staff, 23 percent (250) reside in the study area

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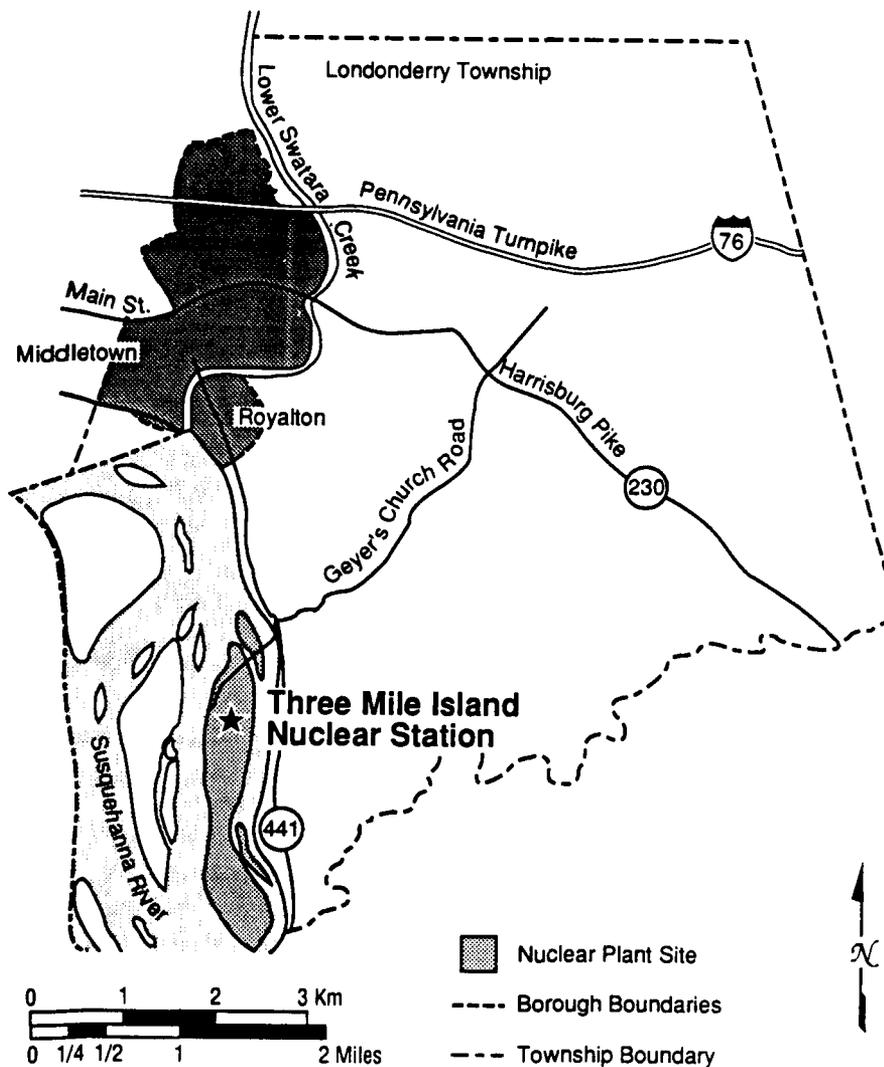


Figure C.14 Socioeconomic impact area associated with Three Mile Island refurbishment: Middletown, Royalton, and Londonderry Township.

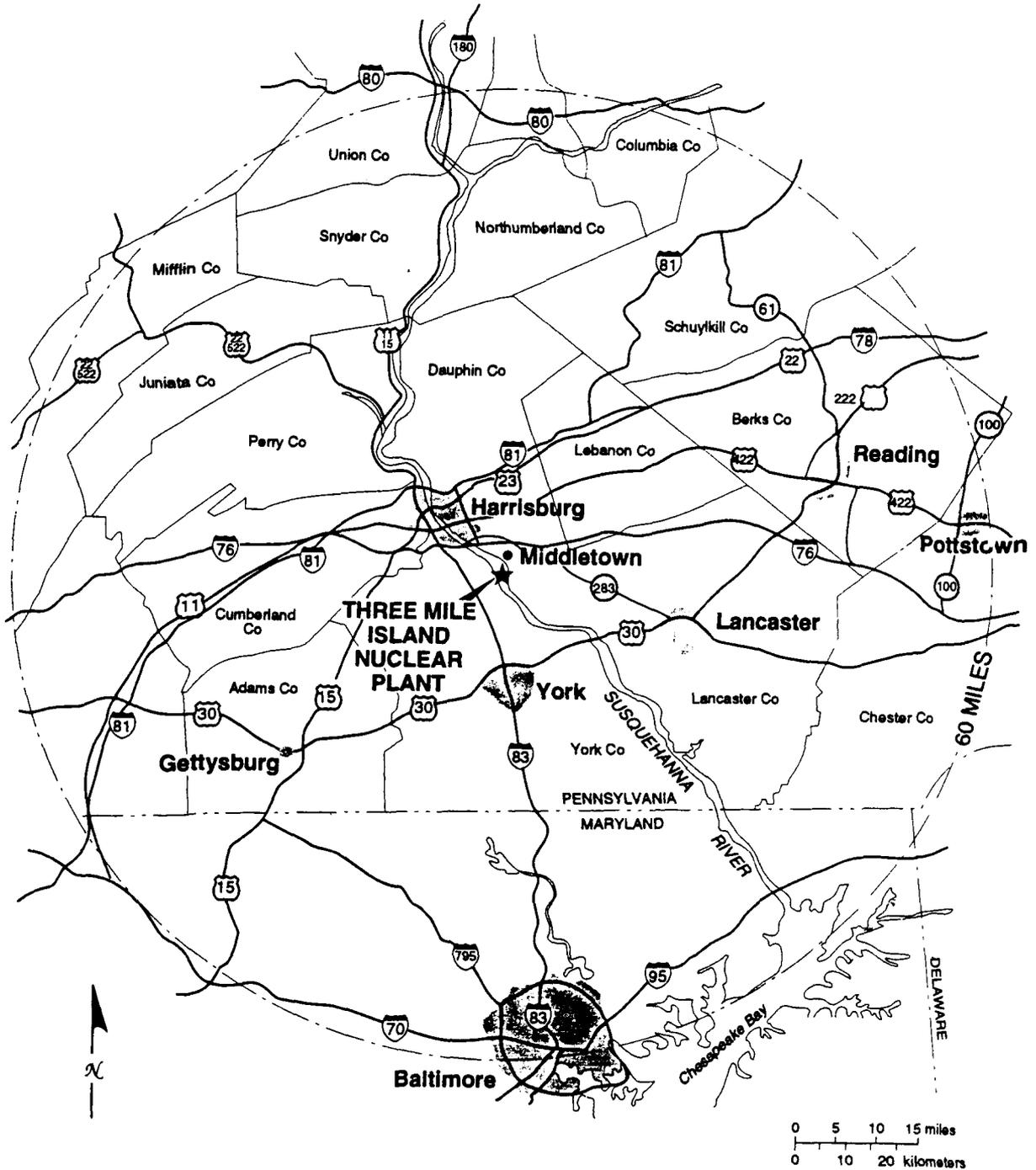


Figure C.15 Region surrounding the Three Mile Island nuclear plant.

(GPU 1990). Based on the residential settlement pattern of TMI's 1978 work force, it is estimated that 195 (78 percent) of those residing in the study area in 1990 were prior residents who obtained operations jobs and that 55 (22 percent) were workers who have migrated into the area for jobs (Table C.69). Also following the pattern set during plant operations, it is assumed that all of the in-migrants were accompanied by their families. Assuming the 1990 Pennsylvania average family size of 3.1 persons, this represents a total in-migration of 171 new residents for the study area. Based on the distribution of nonplant jobs created in the study area in 1978, it is projected that TMI's 1990 operations created an additional 115 indirect jobs in service industries supported by the spending of TMI workers. As a result of these indirect jobs, an estimated 33 additional workers and their families (a total of 75 persons) moved into the study area (Table C.69). In all, it is estimated that approximately 246 new residents moved into the study area as a result of TMI's 1990 operations. These new residents make up about 1.7 percent of the study area's 1990 population of 14,636 (NUREG/CR-2749, vol. 12, pp. 66-78; U.S. Bureau of the Census 1990).

C.4.6.1.2 Predicted Growth Resulting from License Renewal

As discussed in Section C.3.1, TMI's license renewal would require the completion of a number of refurbishment tasks for Unit 1. Many of the refurbishment tasks are expected to be completed during scheduled refueling outages during the 10 years that precede expiration of the initial operating license. However, the final refurbishment work is expected to be completed during one large refurbishment outage in 2013, the year before the initial operating license expires. As this final refurbishment outage

would involve more workers on-site over a longer period of time than any of the preceding refueling outages, it represents the peak refurbishment period for TMI Unit 1. However, because uncertainties exist concerning the length of the outage and the size of the work force required to complete the refurbishment of a given unit, this section examines a bounding case work force scenario as described in Sections C.3.1 and C.4.1.1.2.

Given the work force scenario detailed in Section C.3.1, it is estimated that 2273 workers would be on-site to complete refurbishment of TMI Unit 1 in 2013 (SEA 1994). Further, assuming that the residential distribution of refurbishment workers would be similar to that of the 1972 TMI construction work force, it is estimated that 8 percent (182) would reside in the study area. Based on plant construction experience, it is projected that 28 percent (51) of those residing in the study area would be prior residents who obtain refurbishment jobs and that 72 percent (131) would be workers who migrate into the area for refurbishment jobs (Table C.70). Also following the pattern set during plant construction, 9 percent of the in-migrants (12) would be accompanied by families. Using the Pennsylvania average family size of 3.1 persons, total refurbishment worker in-migration would result in 156 new residents for the study area.

Based on the ratio of nonplant jobs created in the study area in 1972, TMI's refurbishment is projected to create an additional 50 indirect jobs in service industries supported by the spending of TMI refurbishment workers. As a result of these indirect jobs, an estimated 14 additional workers and their families (a total of 33 persons) would be projected to move into the study area (Table C.70). In all,

approximately 189 new residents would be expected to move into the study area as a result of TMI's refurbishment under the work force scenario. That would represent 1.0 percent of the study area's projected population of 18,223 in 2014 (NUREG/CR-2749, vol. 12, pp. 50-55, 74-76).

Once plant refurbishment is completed for TMI Unit 1, the work force would consist mostly of permanent plant staff. Additional refurbishment/refueling workers would be temporarily on-site approximately every 2 years; however, they would not be permanent, on-site plant staff, and many of them are expected to commute from outside the study area. It is expected that a maximum of 60 additional permanent workers would be required to operate the relicensed unit. Assuming that the new workers' residential distribution would be the same as the current plant staff's, approximately 23 percent (14) would reside in the study area. Based on worker in-migration in 1978, it is expected that 78 percent (11) of those residing in the study area would be prior residents who obtain jobs and that 22 percent (3) would be workers who migrate into the area for jobs (Table C.71). Also following the pattern set during plant operations, it is assumed that all of the in-migrants would be accompanied by their families. Using the Pennsylvania average family size of 3.1 people, total in-migration would result in 9 new residents for the study area. Based on the ratio of nonplant jobs created in the study area in 1978, TMI's license renewal term is projected to create an additional 6 indirect jobs in service industries supported by the spending of plant workers. As a result of these indirect jobs, an estimated 2 additional workers (one with a family, for a total of about 4 persons) would be projected to move into the study area (Table C.71). In

all, approximately 13 new residents would be expected to move into the study area as a result of TMI's license renewal term. That would represent less than 0.1 percent of the study area's projected population in 2014 (NUREG/CR-2749, vol. 12, pp. 58-60, 76).

C.4.6.2 Housing

The following sections examine the housing impacts that occurred in Middletown, Londonderry Township, and Royalton during construction and operation of TMI and predict housing impacts that would result from refurbishment activities and continued operation. Possible impacts to housing include changes in the number of housing units, particularly the rate of growth of the housing stock; changes in occupancy rates; changes in the characteristics of the housing stock; and changes in rental rates or property values.

Section C.4.1.2 includes a complete discussion of methodology and assumptions used to predict housing impacts.

C.4.6.2.1 Impacts from Plant Construction and Operation

The following discussion begins with a description of the housing market at the time of TMI's construction and details project-related housing demand in the study area. A discussion of changes that occurred in the housing market and plant construction-induced impacts on housing follows. Finally, impacts from the operation of TMI on local housing are assessed.

Between 1970 and 1978, when construction at TMI was completed, building permits were issued for 1364 units in Londonderry Township, Middletown, and Royalton combined. Of these new units, 1113 were in Middletown, 238 in Londonderry, and only

13 in Royaltown (NUREG/CR-2749, vol. 12). The majority of new units in Middletown were multifamily units, including two low-income projects, a very large (>700 units) development called Village of Pineford, and the conversion of old homes into apartments. New units in Londonderry were mostly single-family units. These additional units made up a 30 percent increase in the 1970 housing stock and marked a turnaround in the declining growth that had been experienced before 1970. In the intercensal period 1960-70, the housing stock decreased by more than 400 units, a decline largely attributed to the closing of Olmstead Air Force Base (NUREG/CR-2749, vol. 12).

Project-related demand for housing in the study area has been estimated according to the number of plant construction and operations workers who moved to the area (NUREG/CR-2749, vol. 12). During 1972, the average annual project-related work force peaked at 2746, resulting in a demand for 146 units in the study area. This demand is the equivalent of 2.8 percent of the 5190 housing units in the study area in 1972.

The study area housing stock was expanding much faster than project-related demand. There were 55 rental units and 22 for-sale units vacant in 1970 in Middletown (U.S. Bureau of the Census 1972). In 1970 and 1971, over 600 multifamily units were added to the Middletown housing stock, while Londonderry experienced an increase of 39 multifamily units (NUREG/CR-2749, vol. 12). The construction of the multifamily units in Middletown (the Village of Pineford), it appears, had little to do with project-related demand. After construction of TMI was completed, the vacancy rate of this development did not increase (NUREG/CR-2749, vol. 12).

Another change in the housing stock was the development of five mobile home parks in Londonderry Township in the early 1970s. Some in the area saw a conspicuous association between the mobile home parks and the construction of TMI, though three of the park owners reported that they never had more than six TMI workers located in their parks (NUREG/CR-2749, vol. 12).

Property values and rental rates are not believed to have been affected by TMI construction. Increases in rates or values were no greater than the overall inflation rate. Between 1970 and 1980, housing values increased 187 percent in Middletown and the state of Pennsylvania. However, rental rates in Middletown increased 200 percent, whereas a 75 percent increase occurred in Pennsylvania. The numerous new rental units that were added to Middletown's housing market between 1970 and 1980 were a primary cause for the increase in rental rates.

Although discernible changes in the housing market and in housing values and rental rates did occur during the construction period of TMI, it appears that TMI had little to do with these changes. In summary, construction of TMI had only an insignificant effect on housing.

Because of the 1979 accident at TMI Unit 2, there has been unique potential for impacts to housing in the surrounding area. Possible impacts resulting from the occurrence and aftermath of the accident might include changes in housing value and in patterns of housing development. Most realtors and planners contacted in the course of this research agreed that normal operation of the TMI units had no effect on housing development or values. One thought that residential development had been encouraged by the permanent location of

operations workers in the area, whereas another thought that residential development that had been occurring on the east bank of the Susquehanna River slowed when the plant began operations.

Most informants reported that any negative effects from the accident at TMI Unit 2 on the housing market were short-lived if at all existent. Construction of a townhouse development in Lower Swatara Township (neighboring Londonderry) ceased as a result of the accident, and the developer did not resume the project. Although one informant cites TMI and the accident as the most likely reason for the absence of development in the area near the plant, another believes a more likely reason is the lack of public sewer and water service there. The number of building permits issued in the study area followed the trend occurring throughout the Harrisburg Standard Metropolitan Statistical Area. The trend in this three-county area was a decrease in the number of building permits issued between 1978 and 1979 and between 1979 and 1980, followed by an increase in permits between 1980 and 1981 (TCRPC 1982). Londonderry Township followed this trend closely but did not experience an increase in permitting until 1982. Middletown, on the other hand, experienced an increase in building permits both in 1980 (22 percent more than those issued in 1979) and 1981 (27 percent more than those issued in 1980).

Immediately after the accident, some home buyers from outside the local area were averse to living near TMI. This was the case particularly with homes that looked out over the cooling towers. This resulted in longer selling time for these homes. In only a few instances have homeowners sold or tried to sell their residences because of the TMI accident.

Opinions differ regarding the effect of the TMI accident on housing values. Some local realtors and planners believed that there had been no effect. Another realtor, whose business is primarily in Middletown and Londonderry Township, reported that values of houses and property in two small subdivisions (30 to 50 homes each) close to the plant had been affected negatively by the accident at Unit 2. Housing values there dipped below fair market price for a period of approximately 5 years, although these homes are now selling at fair market price. Another respondent believed that values of homes in close proximity to the plant had not kept pace with the value of homes in other areas of Middletown.

In summary, the accident's effects on housing values were minor and of short duration. Similarly, effects on housing development were minor; the cancellation of the townhouse development project (noted above) because of the TMI accident was an isolated case.

C.4.6.2.2 Predicted Impacts of License Renewal

Project-related population increase and the commensurate housing demand would be the cause of housing impacts during refurbishment activities. A summary of recent and anticipated growth in housing is provided below. This is followed by predictions of possible impacts during refurbishment and the license renewal term.

Housing in Londonderry Township, Middletown, and Royalton expanded between 1980 and 1988 at an average annual rate of approximately 0.5 percent (U.S. Bureau of the Census 1982; Dauphin County Planning Commission 1988). If expansion continued at this rate, there would be 7376 housing units in 2013, the

peak year of refurbishment at TMI Unit 1. The projected population of the study area in 2013 is 17,091 (Section C.4.6.1) and will require 6975 housing units. Although adjustment in housing growth will be made according to population growth, the current rate of growth suggests that there will be housing available in the study area during refurbishment activities.

According to the estimate of the number of refurbishment workers required and based on plant construction experience, 131 workers of the 273-member work force are expected to migrate to the area for refurbishment jobs. Of these in-migrants, only 12 are expected to be accompanied by families. Some doubling-up is expected to occur among the 119 unaccompanied workers, so that each unaccompanied mover would require 0.85 housing unit. The in-migration of these refurbishment workers would result in a housing demand in the study area of 113 housing units. In addition, some indirect jobs would be created by the spending of refurbishment workers. An additional 11 workers are expected to move to the study area, bringing the total project-related housing demand to 124 units.

Refurbishment-related housing demand is less than the original construction-related housing demand of 146 units, and the number of housing units in the study area would have increased 42 percent between peak construction and refurbishment periods. Refurbishment-related housing demand would account for 1.7 percent of the possible 7376 housing units in the study area in 2013. Because demand would be small relative to the projected housing market and would be even less than that experienced during construction (when only small housing impacts occurred), new impacts to housing in the study area are expected to be small.

Housing impacts involving marketability and value expected during the license renewal term would be a continuation of current impacts (Section C.4.6.2.1). New impacts involving housing demand and availability caused by the additional 60 workers required during the license renewal term would be small.

C.4.6.3 Taxes

C.4.6.3.1 Impacts from Plant Construction and Operation

The construction of Unit 1 of TMI began in May 1968, with operation beginning in September 1974. Unit 2 construction began in November 1969, and its operations began in December 1978. In March 1979, a major accident at Unit 2 led to the permanent shutdown of this part of the facility.

The impacts of tax revenues from TMI on its surrounding municipalities and jurisdictions are minimal in that the Pennsylvania tax structure is designed so that local areas do not benefit directly from property taxes on electric generating facilities. In general, the operation of TMI has had insignificant effects of taxing jurisdictions in the area because these local municipalities did not receive direct property tax payments. This is not the case in most other power plant locations in the United States. The Public Utility Realty Tax Assessment of 1970 (PURTA) imposed an annual tax on the depreciated cost of utility real estate at a rate of 30 mills per \$1,000 of assessed valuation. The state distributes to each locality throughout the state an amount proportional to its share of all property taxes collected in the state.

The PURTA taxes paid by General Public Utilities Corporation (GPU) for TMI increased from \$1 million in 1970 to

\$5.8 million in 1978. With the removal of Unit 2 from operation in 1979, PURTA tax payments fell to \$2.8 million in 1980. PURTA tax payments rose steadily in the 1980s to \$3.2 million in 1985 and \$4 million in 1989.

The boroughs (towns) nearest the TMI site are Middletown and Royalton (combined population of 10,000 in 1970 and 12,000 in 1990). The plant is located in Londonderry Township (population of 3453 in 1970 and 5500 in 1990), where there have been income-related tax collections that were a relatively high proportion of the total revenues of the township.

As shown in Table C.72, total revenue in Londonderry Township increased from \$277,177 to \$330,953 (1980 dollars) between 1980 and 1989; this amounts to a 19.4 percent increase. Occupational privilege taxes (place-of-work taxes) during the study period have been reduced sharply compared to the peak construction effort in the 1970s. The occupational privilege tax was at its peak in 1972 at \$58,527 and fell steadily through 1989, when the tax was \$13,255. This reduction reflects the decrease in the number of construction workers residing in the township. The PURTA tax distributions from the state are a very small fraction of total revenues for the township, ranging from a high (but still insignificant) contribution of only 1 percent to a low of 0.7 percent during the 1980s.

Earned income taxes have been the largest source of revenues for Londonderry Township. This tax is levied on all workers living in Londonderry Township. These tax receipts are especially large during construction periods, because workers residing in states other than Pennsylvania are required to pay the 1 percent tax to the township. For workers who are residents of

Pennsylvania, the tax is split evenly between the township and the school district in which the worker resides.

Middletown Borough

As can be seen from Table C.73, total revenues in the borough of Middletown have increased steadily in recent years, largely the result of the reselling to local residents of electricity purchased wholesale under a long-term contract with Metropolitan Edison. The borough's purchase contract with Metropolitan Edison is not contingent on the existence or operation of TMI.

Royalton Borough

In a contractual relationship similar to that of the borough of Middleton, the borough of Royalton has steadily increased its total revenues through a heavy reliance on the resale of electricity purchased from Metropolitan Edison (Table C.74).

Middletown Area and Lower Dauphin School Districts

The Middletown Area School District (MASD) and the Lower Dauphin School District (LDSD) are the major school districts in the TMI study area. Enrollments in the two school districts have declined steadily from the start of construction of Unit 1 in 1968 to the present. The LDSD enrollment was 4021 in 1968 and fell 16 percent, to 3385, in 1990. Enrollments in MASD declined from 3102 in 1968 to 2625 in 1990, for a decrease of 15.4 percent. Apparently, there has been no correlation between the work force at TMI and enrollment at the two school districts.

Mountain West Research, Inc., estimated the project-related enrollment of the two

school districts in 1978 to be 35 and 13 for MASD and LDSD, respectively (NUREG/CR-2749, vol. 12). We estimate the current project-related enrollment to be 13 and 3, respectively, because of the drop in work force at the plant from 2872 in 1978 to 1086 in 1989.

Local taxes paid to the school districts are a combination of real estate taxes, a 0.5 percent earned income tax for residents of the school district, a per capita tax, a real estate transfer tax, and an occupation tax. In addition, the PURTA taxes are apportioned to the school districts in a way similar to those for municipalities. The contribution of taxes paid by TMI to the school districts is insignificant compared to the district's total revenues, with PURTA taxes alone currently accounting for less than 1 percent of the total taxes received for both school districts.

C.4.6.3.2 Predicted Impacts of License Renewal

During refurbishment of TMI, a new tax-related impact is expected to occur. This new impact involves increases in tax payments because of capital improvements that take place during the current term outages. Tax increases resulting from improvements made in the final refurbishment outage would affect taxes only during the license renewal term. The impact of the additional tax revenues would be small in the local jurisdictions because new revenue (i.e., the PURTA taxes) would be distributed statewide.

During the license renewal term, the primary tax-related impact would be the continuation of TMI's PURTA tax payments. A new impact would also result from the increase in tax payments resulting from improvements made at TMI Unit 1 during the final refurbishment period. Thus, total PURTA

tax revenues would increase in absolute terms, although PURTA tax distribution to individual municipalities would continue to constitute only small portions of their total revenues.

C.4.6.4 Public Services

C.4.6.4.1 Impacts from Plant Construction and Operation

The construction and operation of TMI have coincided with a period of growth in southern Dauphin County, and with that growth have come greater revenues and expenditures. The presence of TMI affects the varying jurisdictions and their services differently; overall, the impacts have been greater on Londonderry Township than on Royalton and the two nearest school districts, and much more than on Middletown.

Middletown and Royalton are designated as boroughs, of which there are 16 in Dauphin County; the county also comprises 25 townships. A township is a subcounty area with the status of a legal municipality, originally established for administrative purposes, whereas boroughs are small towns within townships. Londonderry Township is governed by a three-member board of supervisors, elected at large, who serve in both legislative and executive capacities.

Both of the boroughs, Middletown and Royalton, have mayor-council governments. In Pennsylvania, townships and municipalities designated as boroughs have a high degree of administrative autonomy in several areas, such as the regulation of taxes (by determining millage rates, for example); structure of government, zoning, and planning policy; and provision of public services (NUREG/CR-2749, vol. 12, p. 91-93).

Information pertaining to revenues and expenditures is discussed in detail in Section C.4.3.3.

Education

Two school districts are in the study area, MASD and LDSD. Londonderry Township and three other townships make up LDSD, and about 32 percent of the students in that district reside in Londonderry Township. The only school in the township is Londonderry Elementary, and it is attended by Londonderry Township residents only. In 1972, its enrollment was 666 students, 32 percent of all elementary students in LDSD. During construction of TMI, enrollment in LDSD decreased, but the decline was erratic, following no regular trend. There is no evident correlation in the pattern of decline and the number of construction workers at TMI.

Construction-related enrollment in LDSD was not very large, amounting to only 0.1 to 0.2 percent of all students in 1972-73 and 1978-79, respectively (NUREG/CR-2749, vol. 12, pp. 106-108).

A local respondent reported insignificant effects of TMI's construction on district enrollment, and it was noted that employees were evenly distributed throughout the area. The most visible effect of TMI's construction was monetary, but the only real direct effect of the construction was a one-time real estate transfer tax of \$250,000 collected by LDSD when Unit 2 changed hands from Jersey Central Power and Light to Metropolitan Edison (NUREG/CR-2749, vol. 12, p. 110).

Both Middletown and Royalton are part of MASD, which also includes neighboring Lower Swatara Township. Roughly 70 percent of the students in the district resided in the study area during

construction, but the project-related enrollment was estimated to be only 1.0 to 1.2 percent of the total enrollment (33 to 35 students). An initial rise in enrollment occurred after construction began, but numbers declined steadily after 1972. An official of MASD confirmed that although TMI drew many people with school-aged children into the area, there was no stress put upon the school system (Strohecker 1990). As with LDSD, there does not appear to be any correlation between the pattern of decline and the number of construction workers at TMI (NUREG/CR-2749, vol. 12, p. 106).

Operations at TMI have also had insignificant impacts in the school districts. The accident in 1979 caused the schools to be closed down for a few days, and evacuation plans have also been developed following the accident. While many workers were involved in the clean-up effort, the presence of extra workers did not have an impact on the schools.

Transportation

During construction at TMI, there were moderate impacts on transportation in the study area. Increased traffic from the TMI work force created congestion and some inconvenience along Highway 441. However, it dissipated quickly because of the nearby interchanges with Interstate I 283. Along Geyer's Church Road and Highway 230, especially during shift changes, increased traffic was also noted. As Table C.75 shows, counts at the peak of construction, in 1972, were nearly twice the traffic levels of a decade earlier. Nevertheless, the TMI construction traffic was modest on Highway 230 in comparison to the daily traffic generated by nearby Olmstead Air Force Base, which employed approximately 10,000 civilians before its closing (NUREG/CR-

2749, vol. 12, p. 114). The impacts of operations at TMI on transportation have been insignificant. None of the informants reported a change in the demand on transportation since TMI began operations.

The effects of maintenance activities have been greater than those during normal operations but still not as large as at the time of construction. There is no indication that TMI traffic has had a substantial effect on road maintenance requirements or that it has changed long-term transportation patterns in the study area (NUREG/CR-2749, vol. 12, p. 114).

Public Safety

Each of the jurisdictions provides varied levels of public protection; in each, however, public safety services have improved because of the construction of TMI. Middletown's police force changed little during construction. Two police officers were added after 1974, raising the number to 18; the department budget rose accordingly. There was a consistent rise in the frequency of calls for service, but there was no evidence that construction work at TMI caused an increase in police activities (NUREG/CR-2749, vol. 12, p. 115).

Royalton also maintains its own police department, which was a part-time force of two officers for most of the construction period; in extraordinary cases, it depends on state police forces or neighboring municipalities for assistance.

Unlike the boroughs, Londonderry Township has no police department, relying totally on the state police for protection. An informant at the Pennsylvania State Police Department stated that construction at TMI had no large impact on the services of his department.

Fire protection and rescue services have also improved in the study area. The three fire companies located in Middletown serve Middletown and Royalton boroughs and have separate specialties. Similarly, ambulance and emergency services for both are coordinated through a communications center located on the premises of the Middletown Police Department.

In 1974, near the end of construction, one of the fire companies moved to new housing that was federally funded, and all of the companies became more professional. Londonderry Township maintains its own fire department, and during the construction period it acquired an ambulance and rescue unit. Public safety expenditures experienced slow, steady growth through the construction period in Londonderry Township. However, those interviewed did not see any effects from TMI's construction on the demand for public safety (NUREG/CR-2749, vol. 12, pp. 115-117).

Municipalities are required to have a volunteer emergency management squad. The Dauphin County Emergency Management Office reported that squads were in place before TMI was built. In Middletown, the emergency squad remained small throughout the construction period. However, the Middletown squad is concerned with other facilities in addition to TMI, such as a chemical plant and railroads in the borough and the nearby Harrisburg International Airport. Additionally, an 8-km (5-mile) evacuation plan was developed.

Operations and refurbishments at TMI have definitely affected public safety in the study area, especially because of the demands on emergency management: the evacuation plan is now much more detailed. The police have also been affected, not so much by the plant's daily operations, according to the

state police, as by the evacuation following the 1979 accident.

The mayor of Middletown reported that operations at the plant greatly affect the borough; its emergency management plan must be kept up to date and be in place for TMI to operate. The power company works closely with the municipalities to formulate their emergency evacuation plans, and it strives to maintain good public relations.

Social Services

No social or health services are provided by Londonderry Township or by the two boroughs. Social programs are run by the county or the state, and residents must go to Harrisburg to receive any of these services. The only social programs located in the study area are a day-care center for low-income working mothers (NUREG/CR-2749, vol. 12, p. 117) and some programs for senior citizens (Hoke 1990; Hamer 1990). No informant reported effects from TMI on demands or funding for social and health services during construction. Also, there were no reports of impacts from operations or refurbishments.

Public Utilities

Like social services, public utilities have experienced only insignificant impacts from TMI. Londonderry Township provides no water or sewerage treatment. The chairman of the Londonderry Township planning commission said that growth in the area could not be attributed to TMI. Middletown, which also produces and distributes its own electricity, does provide sewer, water, and sanitation services. Local informants were unsure whether there was any effect on public utilities during TMI's construction, but it is believed that effects were small.

Informants reported no increase in demand on public utilities since operations began. In fact, the Middletown planning commission chairman noticed a decrease in demand on services after TMI was completed and began operations. No reports indicated that refurbishments at TMI affect public utilities.

Tourism

Some positive impacts to local tourism were observed during construction. Most of the local leaders reported an increase in tourism in the study area during the construction of TMI, although some variation existed in their reports of its popularity. One noted that the visitor's center was established at that time and that the plant construction was an impressive sight and a strong attraction. However, tourism was already well established in the region, with several nationally popular sites, such as Lancaster County, Gettysburg, and Hershey. Additionally, Middletown is a historic community—the oldest in Dauphin County.

All of the local leaders interviewed noted that tourism at the plant has continued during its operation (especially after the accident in 1979). Although the plant had a slight effect on regional tourism, it has become a small tourist attraction in its own right, attracting visitors into the study area. Local leaders note no adverse effects from increased tourism.

Recreation

Effects on recreation in the study area have been small, although there have been substantial improvements in facilities. Several leaders interviewed stated that TMI's construction had no impact on recreation in the area, although funding rose in Middletown for parks and recreation.

Probably the biggest change in the study area has been in Londonderry Township, which spent several hundred thousand dollars from 1973 to 1975 to acquire land and develop a golf course (NUREG/CR-2749, vol. 12, pp. 103–104); another is under construction now. During the construction of TMI, several new parks were also established in Londonderry Township, but the township planning commission chairman pointed out that these were built to accommodate the needs of community residents already living in the township.

Operations at TMI have had some impacts. For example, a public boat launch and fishing pier have been built on the island. And despite the plant, recreation has grown on the Susquehanna River. A public boat launch and a boat club are in the vicinity.

C.4.6.4.2 Predicted Impacts of License Renewal

Based on the estimate of 2273 direct workers, 189 in-migrants (direct and indirect) would result from TMI's refurbishment (Section C.4.6.1.2). The 21 workers (direct and indirect) who are projected to migrate to the study area with their families will each bring an average of 0.79 school-age children for a total of 17 new school-age children. This assumes an average family size of 3.1 and an even distribution of children from ages ≤ 1 to 18. This small increase would have a small impact on area schools.

During the construction of TMI, impacts on social services, tourism, and recreation were small. Because refurbishment would bring in fewer workers than did initial construction and the population in the study area in 2013 would be larger, any impacts on these public services also would be small.

Public safety, which has been affected mostly by requirements for emergency plans and increased funding, also should experience small effects during the refurbishment period. Public utilities, which were not affected by the construction of TMI, would not be affected by its refurbishment. There would be, however, new changes concurrent with and indirectly related to the plant's continued operations, as Londonderry Township plans to build additional water and sewer systems in the next 30 years or so.

Transportation, which was affected moderately during the construction of TMI, would probably experience effects similar to those that occurred during construction because the operations and refurbishment work force combined would be somewhat larger than the construction force. The combined effects of the operations and refurbishment work forces are likely to create a moderate impact. Transportation impacts of license renewal term operations will be much the same as the small impacts occurring currently.

For *all* public services, impacts during the license renewal term would be essentially unchanged from those experienced during past operations. This means that impacts are expected to be small for all services.

C.4.6.5 Off-Site Land Use

This section describes the off-site land-use impacts of the construction, operation, and license renewal of TMI. The discussion of impacts is concerned primarily with land use in the immediate vicinity of the plant, but impacts for Middletown, Royalton, and Londonderry Township are described where appropriate. Land-use impacts are examined for two time periods. First, Section C.4.6.5.1 identifies the land-use impacts of TMI's construction and operation. Next,

Section C.4.6.5.2 projects the land-use impacts of TMI's refurbishment period, based on the impacts that occurred during the plant's construction. Also, Section C.4.6.5.2 projects the land-use impacts of the plant's license renewal term based on the impacts that have occurred during operations. Information sources for this report include the *Final Environmental Statement Related to Operation of Three Mile Island Nuclear Station, Units 1 and 2* (AEC Dockets 50-289 and 50-320); *Socioeconomic Impacts of Nuclear Generating Stations: Three Mile Island Case Study* (NUREG/CR-2749, vol. 12); and interviews with key sources in Dauphin County. Section C.4.1.5 describes the methods used to assess and project land-use impacts for all case study plants.

C.4.6.5.1 Impacts from Plant Construction and Operation

TMI was constructed on an 80-ha (200-acre) site on Three Mile Island, a 191-ha (472-acre) island in the Susquehanna River near Middletown. The Metropolitan Edison Company had owned the island since 1906 and had acquired several of the surrounding islands by the time TMI's construction began in 1967. Before the plant's construction, more than half the island had been leased for farming, and much of the remaining land was wooded. There were also 70 rental cabins, a picnic area, and a boat dock on the island (AEC Dockets 50-289 and 50-320; NUREG/CR-2749, vol. 12).

Overall, TMI's construction had insignificant land-use impacts in the immediate vicinity because the direct impacts of construction were almost completely confined to the island. Most of the 80-ha (200-acre) plant site had previously been cleared for agricultural use, and only 11 ha (28 acres) of additional wooded area had to be cleared.

All but 2 of the 70 cabins that were on the island before construction were moved to nearby Beshore Island. Because the cabins belonged to the Metropolitan Edison Company, their removal did not entail relocating permanent residents. A small section of state-owned Sandy Beach Island was affected by the construction of piers for the bridge erected from TMI to Highway 441. On the river's east bank, Metropolitan Edison purchased 3 ha (8 acres) of farmland (which included three farmhouses) to construct the visitor's center and 0.8 ha (2 acres) of woodland to construct a substation. In general, these off-site construction activities had only insignificant effects on land use in the island's vicinity (AEC Dockets 50-289 and 50-320; NUREG/CR-2749, vol. 12).

TMI's construction had even fewer land-use impacts in Middletown, Royalton, and Londonderry Township. When the plant's construction began, Middletown and Royalton were small, older urban residential areas with some limited commercial and industrial development. Londonderry Township was predominantly rural, with scattered farmhouses and some very limited suburban residential development. Some residential construction occurred, in part because of the influx of construction workers, but key informants indicated that the growth was not significant enough to affect the area's general residential development pattern. The respondents felt that, overall, TMI's construction had neither positive nor negative land-use impacts in any of the three communities.

TMI's operation, including the 1979 accident at Unit 2, also has had relatively insignificant direct and indirect land-use impacts in the study area. Key sources stated that even after the accident the plant's presence had not been a deterrent to residential

development along the Susquehanna River near the island, or in Middletown, Royalton, or Londonderry Township. Respondents believe that the plant has had neither positive nor negative impacts in terms of attracting industries to the area and that it has had only minor indirect effects in fostering positive commercial development. In general, land use in the area from Middletown south to Marietta along the east bank of the Susquehanna has not changed significantly since before TMI's construction. However, sources attributed this lack of residential, commercial, and industrial development to a number of factors other than TMI's presence. Some of the more important factors included the following: (1) Middletown and Royalton were already "built up," and little land was available for new development in either jurisdiction; (2) Londonderry Township did not provide the public sewer and water services necessary for large-scale development; (3) the general size and condition of the area's roads were inadequate to support industrial development; and (4) the region was experiencing an economic decline related to a downturn in the steel industry and the closing of the Bethlehem plant in Steelton. Overall, sources agreed that TMI's operations have had only very minor land-use impacts in the vicinity of TMI or in Middletown, Royalton, or Londonderry Township.

C.4.6.5.2 Predicted Impacts of License Renewal

The direct impacts of TMI's refurbishment and license renewal term on land use in the immediate vicinity of TMI and in Middletown, Royalton, and Londonderry Township are expected to be small. The plant itself is not expected to attract or discourage new residential, commercial, or industrial development directly.

Refurbishment-related population growth is projected to represent 1.0 percent of the study area's projected population in 2014. The license renewal term is projected to result in population growth of less than 0.1 percent in the study area in 2014. During both refurbishment and the license renewal term, increases this small are likely to have only minimal new impacts in terms of residential development patterns.

Key information sources agree that land-use patterns in Middletown and Royalton are well-established and that the area has a general lack of developable land. Therefore, TMI's license renewal is expected to have only minimal new impacts on the two jurisdictions' land use. Growth is expected in Londonderry Township, as the township plans to extend its sewer and water services to allow for (1) residential and commercial development along Route 230 and (2) commercial and industrial development near Interstate 283 and at the southern end of the township near Conewago Creek. TMI's refurbishment might contribute slightly to this growth, but the township's land-use and development patterns are not likely to be strongly influenced either positively or negatively.

Because Pennsylvania state law provides for the statewide distribution of public utilities' property tax payments, Londonderry Township does not receive a disproportionate share of the benefit from TMI's tax payments. Thus, the township's land-use and development patterns are influenced less by the indirect effects of a nuclear plant's tax payments (i.e., lower property taxes and superior public services) than are those of jurisdictions that receive the majority of the tax benefits of a nuclear plant in some other states. In general, then, both the direct and indirect land-use impacts

of TMI's refurbishment and license renewal term are expected to be small.

C.4.6.6 Economic Structure

C.4.6.6.1 Impacts from Plant Construction and Operation

The construction and operation of TMI have resulted in insignificant and significant impacts, respectively, on Middletown, Royalton, and Londonderry Township. Table C.76 presents the estimated employment and expenditures for residents of the three-municipality study from 1972 to 1990. In 1972, direct and indirect employment resulting from TMI's construction represented only 2.1 percent of the study area's total employment. That represents an insignificant impact.

The 1990 work force at TMI numbered 1086, of whom 250 were study area residents. The operation of the plant has also resulted in 98 indirect jobs, for a total of 348 jobs for study area residents. This level of employment represented 13 percent of the study area's total employment, so the impact is large. The income of this work force represented 17.0 percent of the study area's total income in 1990.

C.4.6.6.2 Predicted Impacts of License Renewal

The work force scenario detailed in Section C.3.1 was used to estimate the employment and economic effects of refurbishment at TMI. Table C.77 shows the total direct and indirect plant-related employment of study area residents during refurbishment.

It is projected that TMI would employ 182 study area residents as refurbishment workers in 2013 (Section C.4.6.1.2). In

addition, indirect employment that would result from purchases of goods and services during refurbishment is projected to create 43 jobs for study area residents. The total direct and indirect employment affecting the study area during the peak refurbishment year is therefore estimated to be 225. This employment is projected to be 6.0 percent of the total study area work force in 2013, resulting in moderate impacts.

Relatively few new plant-related jobs would be created at TMI during the license renewal term. Nearly all plant-related employment (and associated impacts) expected during that time period would represent a continuation of employment (and impacts) from past operations. Table C.78 shows the impact of the increased labor requirements at TMI.

The license renewal term work force for TMI would require an estimated 60 additional employees (Section C.4.1.2). Of these additional workers, 14 are projected to be study area residents. An estimated six indirect jobs are projected to be created by license renewal, and five of these jobs are expected to be filled by study area residents. With the continued effects of the plant's current employment and the additional employment to be created, total direct and indirect license renewal term employment is projected to represent 9.8 percent of study area employment in 2013. This employment level represents a large impact.

C.4.6.7 Historic and Aesthetic Resources

This section describes the impacts that the construction and operation of the TMI nuclear station have had on historic and aesthetic resources and projects the expected impacts of the plant's refurbishment and post-relicensing operations. Information sources include the

Final Environmental Statement Related to the Operation of Three Mile Island Nuclear Station, Units 1 and 2 (AEC Dockets 50-289 and 50-320); the *Draft Supplement to the Final Environmental Statement Related to the Operation of Three Mile Island Nuclear Station, Unit 2* (NUREG-0066); and key information sources from Dauphin County, York County, and elsewhere in Pennsylvania.

C.4.6.7.1 Impacts from Plant Construction and Operation

The construction and operation of TMI have had moderate impacts on the aesthetic resources of the area and small impacts on the historic resources of its surroundings. There were no known archaeological sites on the island before construction. A preconstruction survey turned up artifacts from the Early and Middle Woodland Indian cultures of about 4000 B.C. to 1000 A.D. and some from later times. It was these Early and Middle Woodlands artifacts that were of interest to archaeologists because these eras in Pennsylvania are poorly known (AEC Dockets 50-289 and 50-320). There have been no important impacts to historic structures from the construction and operation of the plant. Fourteen structures listed on the National Register of Historic Places are located within 1.6 km (1 mile) of the plant's 770 ha (1900 acres) of transmission line rights-of-way, but there have been no reports of any impacts (NUREG-0066). The impacts to historic resources that have occurred involve perceptions that the site has changed from a rural area of rolling eighteenth- and nineteenth-century farmsteads to one punctuated with industrial facilities. The perception of this intrusion is made across substantial distances because of the facility's three 110-m-high (370-ft-high) natural draft cooling towers.

The cooling towers and their visible plumes also create the facility's primary aesthetic impacts. One respondent states: "The principal impacts would be visual. ... The towers and the power lines are an intrusion on the rural landscape. Looking at the rural landscape as a part of the historic environment, with all the eighteenth- and nineteenth-century farmhouses, the facilities have a visual impact. There are other types of power plants along the Susquehanna, but they are smaller and not nearly as visible. The steam is an even greater identifier of the plant. You can see it from further away than the towers. And the power lines that come from the station are very visible." At river level (where the visitor's center and a major area highway are), existing trees for the most part obscure a view of the plant's other structures.

The other major aesthetic impact comes from the feelings that persist regarding the accident at TMI in 1979. Such feelings have to some degree colored people's attitudes about nuclear power and therefore their aesthetic perceptions. One source stated: "It's not that the plant's unsightly, it's just that the sight of the plant reminds people of the accident. The area around the plant is in a very sylvan setting, in really pretty countryside with lots of old farmhouses, until you see the plant. When you see the towers over the horizon, it puts people off." Another person referred to the cooling towers as "looming on the horizon for a good distance." One respondent suggested that, all things being equal, home buyers since the accident have generally made decisions to purchase property out of the viewshed of the plant and that new construction of higher-valued homes has generally not favored areas near the plant. This individual posits that decisions to locate outside the viewshed are probably made more with an eye to optimizing the

investment aspect of the property (reduction of risk to property values from another accident) than with concerns about the direct aesthetic impact of the plant and other development in the area on the perceived day-to-day quality of life.

C.4.6.7.2 Predicted Impacts of License Renewal

The impacts of TMI's refurbishment and postlicense renewal operation on historic and aesthetic resources in the area would likely be less pronounced than those that have occurred during construction and normal operation. The 1979 accident sensitized many people to the plant's presence and to its potential for problems. This undoubtedly has affected people's aesthetic preferences and values. Should another major problem occur at this plant (or, possibly, elsewhere), large aesthetic impacts can be expected because the cooling towers and their plumes remind people of the nuclear power plant's presence. Given normal operation during the license renewal term, impacts on aesthetic and historic resources are expected to be a continuation of the current levels of impact. However, determination of impacts to historic resources from refurbishment and license renewal operations must be made through consultation with the SHPO.

C.4.7 Wolf Creek

The impact area—the area in which the most pronounced socioeconomic impacts might result from refurbishment and license renewal—at the Wolf Creek Generating Station (WCGS), consists of Coffey County and towns and communities within Coffey County, Kansas, the largest of which is Burlington. The selection of this area is based on worker residence patterns, employment, expenditures, and tax

payments. Figure C.16 depicts the impact area, and Figure C.17 shows the region in which it is located.

C.4.7.1 Population

This section discusses the local population growth associated with the construction, operation, and license renewal of WCGS. Section C.4.1 describes the methodology used to project population growth for all plants. Data used to prepare this section were obtained from the *Final Environmental Statement Related to the Operation of the Wolf Creek Generating Station, Unit No. 1* (NUREG-0878); *Environmental Assessment for Proposed Rule on Nuclear Plant License Renewal* (NUREG-1398); SEA refurbishment work force estimates (Appendix B; SEA 1994); population projections by the University of Kansas Institute for Public Policy and Business Research (Helyar); and the Wolf Creek Nuclear Operating Corporation.

The discussion of population growth is organized into two time periods. Section C.4.7.1.1 identifies the population growth that Coffey County experienced as a result of the construction and operation of WCGS from 1977 to 1989. Section C.4.7.1.2 projects the population growth expected to result from WCGS's refurbishment period and license renewal term operations beginning in 2025, based on the growth associated with the plant's initial construction. Also, Section C.4.7.1.2 projects the population growth expected to result from WCGS's license renewal term, based on the growth associated with operations in the past.

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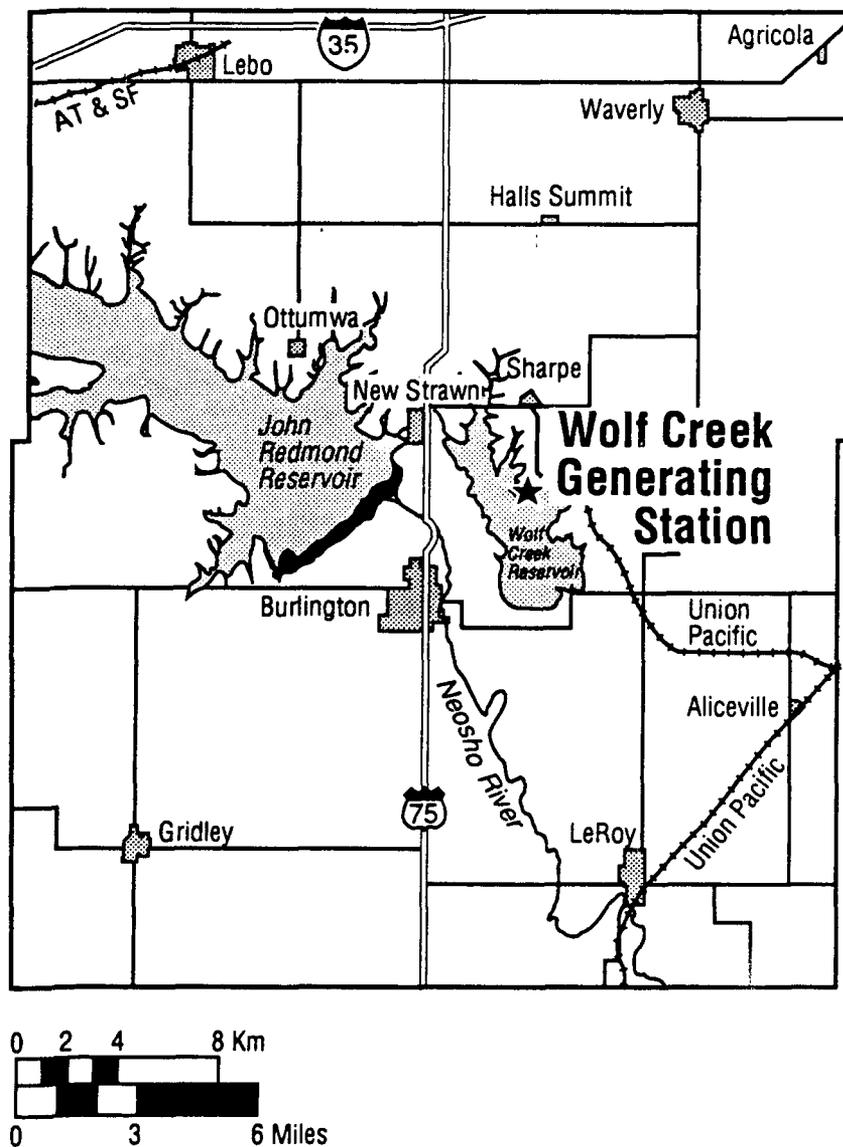


Figure C.16 Socioeconomic impact area associated with Wolf Creek Generating Station refurbishment: Coffey County.

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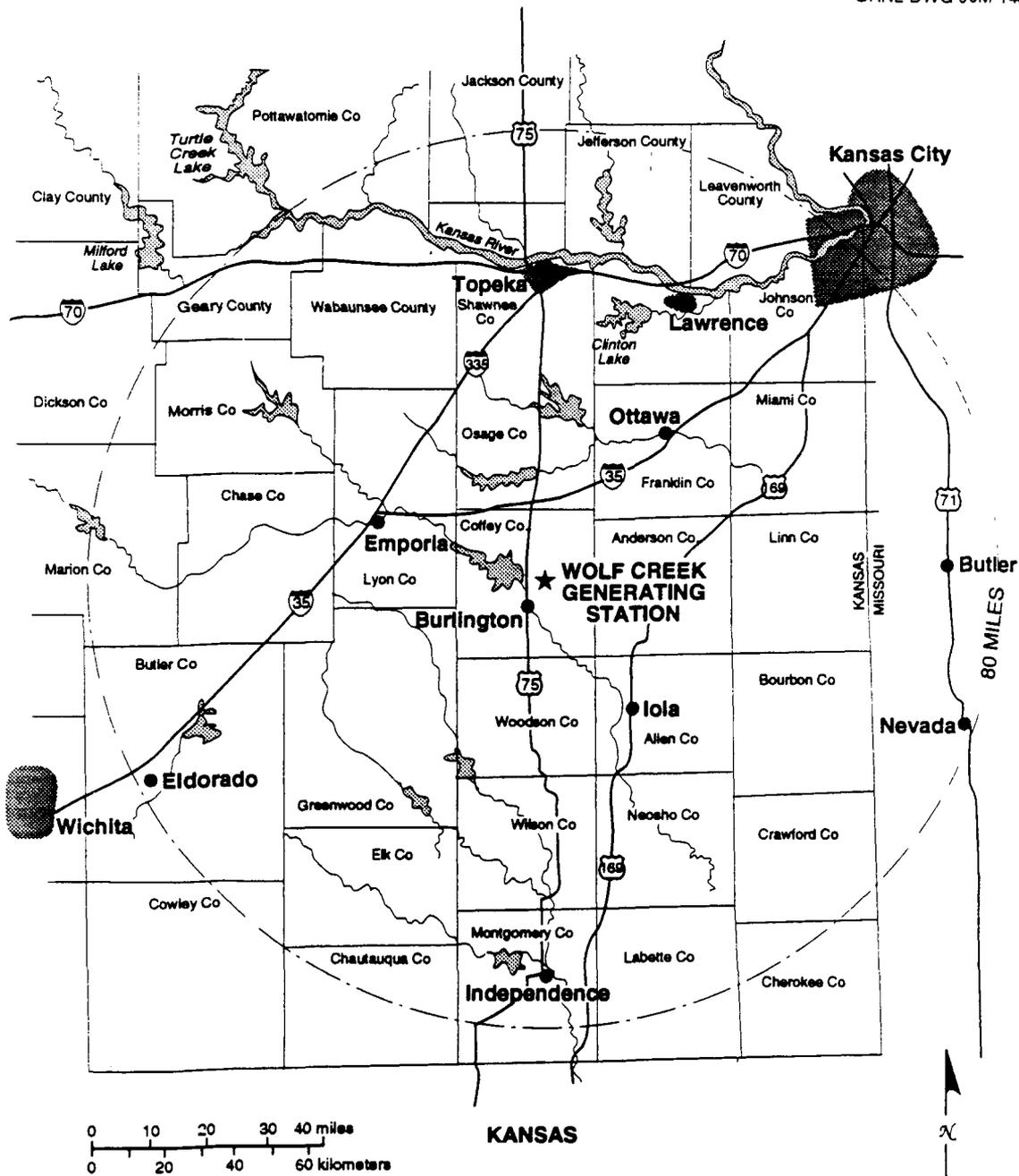


Figure C.17 Region surrounding the Wolf Creek Generating Station nuclear plant.

C.4.7.1.1 Growth Resulting from Plant Construction and Operation

Because Wolf Creek was not included in the NUREG/CR-2749 study, estimates of worker in-migration are based on the construction experience at other nuclear plants in comparable locales. WCGS's construction resulted in very large population increases in Coffey County (Table C.79). During the peak construction year, 1984, approximately 5500 construction workers were on-site at WCGS. Because Wolf Creek is located in a rural county that has no major urban population center and based on residential settlement patterns of construction work forces at other nuclear plants, it is estimated that approximately 20 percent (1100 persons) of the peak construction work force lived in Coffey County (Table C.80). The remainder are estimated to have commuted to the job site (NUREG-75/096). Also, it is estimated that 70 percent of the construction work force residing in Coffey County (770 persons) were workers who migrated to the study area for jobs at the plant. Based on the pattern of construction workers' in-migration at other nuclear projects, it is estimated that 51 percent of the in-migrants (393 workers) were accompanied by their families. Assuming the 1990 average family size for Kansas (3.08), this represents a total in-migration of 1587 residents for Coffey County.

Based on construction in-migration and the ratio of nonplant jobs created during the peak construction periods at nuclear plants in comparable locales, it is estimated that Wolf Creek's peak construction period created an additional 275 jobs in service industries supported by the spending of WCGS construction workers. As a result of these indirect jobs, an estimated 144 additional workers and their families (a total

of 342 persons) moved into the study area (Table C.80). In all, it is estimated that approximately 2329 new residents moved to Coffey County as a result of Wolf Creek's peak construction period. This influx of new residents represented 20.5 percent of Coffey County's total population in 1984.

Operations at WCGS have resulted in smaller population increases than did the plant's construction, but the increase still has been relatively large. In 1989, 1044 permanent plant staff were on-site at WCGS (additional contract workers have been on-site during outages, but they have not been included because their presence at the plant was temporary). Of the permanent plant staff, approximately half (522) live in Coffey County (Wolf Creek Nuclear Operating Corporation 1990). Based on residential settlement patterns of workers at nuclear plants in comparable locales, it is estimated that 50 percent (261) of those residing in Coffey County in 1989 were prior residents who obtained jobs and that 261 were workers who migrated into the area for jobs (Table C.81). Also following the pattern set by personnel in-migrating to work at other nuclear plants, it is estimated that 66 percent of the in-migrants (172) were accompanied by their families. Assuming the 1990 Kansas average family size of 3.08 persons, this represents a total in-migration of 619 residents for the county. Based on work force in-migration and the ratio of nonplant jobs created at other nuclear plants during operating periods, it is estimated that Wolf Creek's 1989 operations created an additional 418 indirect jobs in service industries supported by the spending of WCGS workers. As a result of these indirect jobs, an estimated 218 additional workers and their families (a total of 518 persons) moved into Coffey County (Table C.81). In all, it is estimated that approximately 1137 new residents moved into Coffey County as

a result of WCGS's 1989 operations. These new residents made up about 13.3 percent of Coffey County's 1989 population of 8559.

C.4.7.1.2 Predicted Growth Resulting from License Renewal

As discussed in Section C.3.1, Wolf Creek's license renewal would require the completion of a number of refurbishment tasks. Many of the refurbishment tasks are expected to be completed during scheduled refueling outages during a period of 8 to 10 years before the actual license renewal date. However, the final refurbishment work is expected to be completed during one large refurbishment outage scheduled for the year before the unit's license renewal date. As this final refurbishment outage would involve more workers on-site over a longer period of time than any of the preceding refueling outages, it represents the peak refurbishment period. However, because there are uncertainties concerning the length of the outage and the size of the work force required to complete the refurbishment of a given unit, this section examines a work force scenario as described in Sections C.3.1 and C.4.1.1.2.

Given the work force scenario detailed in Section C.3.1, it is estimated that 2273 workers would be on-site to complete refurbishment of WCGS in 2024 (SEA 1994). Further assuming that the residential distribution of refurbishment workers would be similar to that estimated for the 1984 WCGS construction work force, it is estimated that 20 percent (455) would reside in Coffey County. For Wolf Creek, estimates of refurbishment worker in-migration are based on construction experience at nuclear plants located in areas similar to Coffey County. It is estimated that 70 percent (319) of the refurbishment workers living in Coffey County would be workers who

migrate into the area for jobs at WCGS (Table C.82). Also following the pattern set by construction workers' in-migration at other nuclear projects, 51 percent of the in-migrants (163) would be accompanied by families. Using the Kansas average family size of 3.08, total refurbishment worker in-migration would result in 658 new residents for Coffey County. Based on construction in-migration and the ratio of nonplant jobs created during peak construction periods at nuclear plants in comparable locales, Wolf Creek's refurbishment is projected to create an additional 114 indirect jobs in service industries supported by the spending of refurbishment workers. As a result of these indirect jobs, an estimated 59 additional workers and their families (a total of 140 persons) would be projected to move into Coffey County (Table C.82). In all, approximately 798 new residents would be expected to move into Coffey County as a result of WCGS's refurbishment under the work force scenario. That would represent 9.1 percent of Coffey County's projected population of 8763 in 2025.

Once plant refurbishment is completed for WCGS, the work force would consist mostly of permanent plant staff. Additional refurbishment/refueling workers would be temporarily on-site approximately every 2 years; however, they would not be permanent, on-site plant staff, and many of them are expected to commute from outside the study area. It is expected that a maximum of 60 additional permanent workers per unit would be required during the license renewal term. Assuming that the new workers' residential distribution would be the same as current workers', approximately 50 percent (30) would reside in Coffey County. Based on worker in-migration at nuclear plants in comparable locales, it is estimated that 50 percent (15)

of those residing in Coffey County would be prior residents who obtain jobs and that 15 would be workers who migrate into the area for jobs (Table C.83). Also following the pattern set by personnel in-migrating to work at other nuclear plants, 66 percent of the in-migrants (10) would be accompanied by their families. Using the Kansas average family size of 3.08 people, total in-migration would result in 36 new residents for the county. Based on work force in-migration and the ratio of nonplant jobs created at other nuclear plants during operating periods, it is estimated that WCGS's license renewal term would create an additional 24 indirect jobs in service industries supported by the spending of plant workers. As a result of these indirect jobs, an estimated 13 additional workers and their families (a total of 32 persons) would be projected to move into Coffey County (Table C.83). In all, approximately 68 new residents would be expected to move into Coffey County as a result of WCGS's license renewal term. That would represent 0.8 percent of Coffey County's projected population in 2025.

C.4.7.2 Housing

The following sections examine the housing impacts that occurred in Coffey County during construction and operation of WCGS and predict housing impacts that would result from refurbishment activities and continued operation. Possible impacts to housing include changes in the number of housing units, particularly the rate of growth of the housing stock; changes in occupancy rates; changes in the characteristics of the housing stock; and changes in rental rates or property values.

Section C.4.1.2 includes a complete discussion of the methodology and assumptions used to predict housing impacts.

C.4.7.2.1 Impacts from Plant Construction and Operation

The following section details project-related housing demand in Coffey County and describes the housing market at the time of Wolf Creek construction. A discussion of changes that occurred in the housing market and plant construction-induced impacts on housing follows. Finally, impacts from the operation of Wolf Creek on local housing are assessed. Because Wolf Creek was not included in the NUREG/CR-2749 study, estimates of worker in-migration are based on the construction experience at other nuclear plants in comparable locales (Section C.4.7.1).

Construction of Wolf Creek began in 1977 and was completed in 1985. The construction work force peaked in 1984 at approximately 5500. Only 20 percent of the work force resided in Coffey County, but 70 percent of those workers migrated to the area for refurbishment jobs. Other workers, both prior residents and in-migrants, commuted from places within 120 km (75 miles) of the site. Project-related housing demand in Coffey County peaked in 1984 at 713 units. This demand represents 18 percent of the 3928 housing units in Coffey County in 1984.

Year-round housing in Coffey County in 1970, before construction of WCGS, totaled 3067 units. Of these, 92.8 percent were in one-unit structures. Of the occupied units, 21 percent were renter-occupied. The vacancy rate (for sale or rent only) was 3.3 percent. A local source reported that the vacancy rate had increased considerably between 1970 and the beginning of WCGS construction.

Local sources have indicated that during construction, housing occupancy rates,

particularly of rental housing, reached 100 percent. Although many construction workers chose to live in an area more urban than Coffey County, others were forced to do so simply because there was no available housing. Thus, in-migrants located as far away as Kansas City, Wichita, Topeka, and Ottawa. The 1980 census reported a vacancy rate of 3.6 percent in Burlington and 3.3 percent in Coffey County. However, at that time the construction work force was only 2266 members (Braid 1981).

Several changes in the housing stock occurred during WCGS construction. A plant-site mobile home park was added, as were additional connections in the already existing Coffey County mobile home parks. By 1980, 153 mobile homes were in Coffey County, 33 percent more than in 1970. Another change involved the reoccupation of older, dilapidated housing that had previously been unoccupied.

No large-scale developments were initiated during the construction of the plant; however, more houses were built annually during construction than at any time before or since. During the 7-year period before construction, an annual average of 14.4 housing units were built in Burlington (housing permit information before 1977 is not available for other areas of Coffey County). Of these, 80 percent were built in the 3 years before WCGS construction. In the 5 years since construction has been completed, an annual average of 6.8 units have been built. During plant construction, an annual average of 16.4 units were built, about 40 percent of which were in multiunit structures (U.S. Bureau of the Census 1971-90). In 1970, only 12.2 percent of the units in Burlington had been in multiunit structures (U.S. Bureau of the Census 1972).

Rental rates and housing values rose between 1970 and 1980 at a much quicker rate in Coffey County than in the state of Kansas, as is shown in Table C.84. Local sources indicated that no substantial upgrading or new construction occurred to warrant the great increase in rental rates. Rather, the cause for the increases was WCGS project-related demand. It is likely that project-related demand for housing resulted in even greater increases in rental rates and housing values in 1984, the peak construction year.

Since the completion of WCGS construction, rental rates have gone down again and are now 25-30 percent less than they were during construction. Also, housing vacancies, particularly of rental units, are up once again.

Operation of WCGS has had some effect on the Coffey County housing market. A few new homes have been built for operations workers, but no substantial housing development has occurred. The plant has not negatively affected property values; rather, during a recent economic decline in the region, the economic stability provided by the plant, including steady employment, prevented property values from dropping as sharply as would otherwise have occurred. During refueling periods, however, rental occupancy rates approach 100 percent, and all available trailer pads are used. A typical planned outage at Wolf Creek has involved about 640 additional on-site workers.

In summary, housing demand during WCGS construction caused housing availability to be sharply reduced and rental rates to be sharply increased. Despite this, substantial new housing construction did not occur, rather, trailer parks were expanded or added. WCGS operation has not changed the housing market or housing values;

however, the presence of workers involved in refueling activities causes rental occupancy rates to rise considerably.

C.4.7.2.2 Predicted Impacts of License Renewal

Project-related population increases and the commensurate housing demand would be the cause of new housing impacts during refurbishment activities. A summary of recent and anticipated growth in housing is provided. This is followed by predictions of possible impacts during refurbishment and the license renewal term.

Since the completion of WCGS, approximately 10 new units have been added annually to the Coffey County housing stock (U.S. Bureau of the Census 1971-90). At this rate of expansion, there could be 4200 housing units in 2024, the peak year of refurbishment at WCGS. However, many of these housing units are associated with the in-migration of WCGS construction and operations work forces. New housing units are currently being built only when requested by an in-migrating family or to replace an existing structure. The latter case is a likely circumstance considering that 50 percent of the housing units in Coffey County were constructed before 1940. The projected population of the study area in 2024 is 8763; this is 359 persons more than the 1990 population (Section C.4.7.1; U.S. Bureau of the Census 1990). This slow population growth is not expected to sustain the housing growth that has occurred during the last two decades. If half as many houses are built annually between 1990 and 2024 as were built between 1971 and 1990, there would be 3862 units in 2024. The population in 2024 is projected to require 3519 housing units, leaving 343 units vacant. This would result in a 8.9 percent vacancy rate.

The 1990 housing vacancy rate in Coffey County was 10.8 percent.

According to the estimate of the number of workers required for plant refurbishment and based on plant construction experience, 319 workers of the total work force of 2273 are expected to migrate to Coffey County for refurbishment jobs. Of these in-migrants, 163 are expected to be accompanied by families. Some doubling-up is expected to occur among the 156 unaccompanied workers, so that each unaccompanied mover would require 0.85 housing unit. The in-migration of these workers would result in a total refurbishment-related housing demand in the peak year of 296 housing units. In addition, some indirect jobs are expected to result from the spending of project workers. An additional 59 workers are projected to move into Coffey County, bringing the total project-related demand for housing to 355.

Refurbishment-related housing demand is far less than that which occurred during construction, yet it still accounts for 9.2 percent of the projected housing stock. Because projected demand exceeds projected vacancy, housing availability may be drastically reduced and approach zero availability. Competition for existing units may cause great increases in rental rates. Existing mobile home parks will likely be expanded, or new mobile home parks may be added to accommodate project workers. New housing construction would not result because of the brief duration of this peak demand, but previously abandoned housing may be returned to residential use. In summary, large new impacts to housing are possible during refurbishment.

Housing impacts involving marketability and value that would occur during the license renewal term are the same as those currently

being experienced (Section C.4.1.2.1). The 60 additional workers (60 per unit) required during the license renewal term and the commensurate housing demand would cause only small new housing impacts. However, the number of refueling and maintenance workers required periodically would be slightly increased (by approximately 30 workers). Thus, the large housing impacts that are currently experienced in Coffey County during refueling periods would continue and may be slightly exacerbated by the additional workers during the license renewal term.

C.4.7.3 Taxes

C.4.7.3.1 Impacts from Plant Construction and Operation

The construction permit on WCGS was granted in 1977, and commercial operation began in 1985. WCGS was not part of the Mountain West or any other systematic study; therefore, historical data on economic effects are limited.

WCGS pays property taxes to several taxing jurisdictions, although most of them are very small (e.g., water districts, cemeteries) and the taxes paid are insignificant. Substantial amounts are paid to the state of Kansas and significant amounts to Coffey County and the Burlington School District in Coffey County (Fritz). Table C.85 indicates the taxes paid to these jurisdictions for 1980, 1985, and 1989.

The taxes paid by WCGS dominate Burlington School District and Coffey County revenues since the nuclear plant's tax payments make up over 60 percent of the taxes levied by this school district (and about 63 percent of its total revenues) and nearly 45 percent of the total revenues for

Coffey County (Burlington Unified School District 1980, 1985, and 1989).

An indication of the importance of WCGS to the local tax bases can be seen from the increase in total revenue before and after taxes were levied. In 1977, total county revenue was \$1.7 million (all amounts in constant 1989 dollars); by 1985 it had increased to \$10.4 million and reached \$14.7 million in 1988. This was a greater than eightfold increase in revenue over an 11-year period. More than 85 percent of this increase was from increased tax collections. Another indication of tax effects is that per capita tax revenues in 1977 were \$157, and by 1988 they had increased to \$1417. The total per capita property tax paid by WCGS to Coffey County and the Burlington School District was \$2381. This was more than four times the per capita property tax revenues for the entire state of Kansas, which averaged \$520 (1989 dollars) in 1981-82 (U.S. Bureau of the Census 1986).

Taxes paid to the Burlington School District have shown a similar sharp increase. General fund property tax revenues were \$683,000 in 1977-78 (1989 dollars), increasing to \$3.8 million in the proposed 1989-90 budget. The tax revenues paid to the Burlington School District significantly increased expenditures per pupil. The Burlington School District is in a generally poor area of southeastern Kansas; however, the general fund budget per pupil in 1988-89 was \$4605, which was 3 percent above the statewide median for similar-size school districts (Unified School Districts of Kansas 1990). Classroom teacher salaries were also slightly above the statewide average (Kansas Education Department 1990). An important advantage of the large tax base provided by WCGS for the Burlington School District is in the ability to generate capital funds for facilities and

school purchases of equipment and materials. In this respect, the district has significantly better facilities than the surrounding school districts. Expenditures related to the general fund, however, do not fully reflect the large property tax valuation within the Burlington School District because there is a state-imposed cap on annual increases has limited Burlington to annual increases of 2 percent over the last several years (Kansas State Board of Education 1990). The capital outlay fund can be applied to a limit of 4 mills and has no cap on annual increases. However, the teacher salaries and other everyday expenses are paid from the general fund, which has expenditures near the state median but above those of surrounding school districts.

Another effect of WCGS is property tax rates in the local taxing jurisdictions. The Burlington School District has the lowest mill levy of any school district in Kansas. The 1989 total mill levy for Burlington School District was 14.60, compared to the statewide median of 56.39 (Kansas Education Department 1989).

C.4.7.3.2 Predicted Impacts of License Renewal

The new tax-related impact expected to occur during refurbishment of WCGS results from capital improvements undertaken during the current term outages. The assessed value of the plant would increase during this time and thus increase WCGS's tax payments to Coffey County and the Burlington School District. This new impact does not involve capital improvements that take place during the final refurbishment outage and that would be reflected in the plant's assessed value during the license renewal term. The magnitude of the new impact depends on which improvements would occur at WCGS early on and which

would be done during the final outage. For example, if the steam generator is replaced during a current term outage, the assessed value may increase considerably before the license renewal term begins. If steam generator replacement and other major capital improvements are not undertaken early on, the increase in assessed valuation may be only minor. The increase, in either case, is expected to cause only a small to moderate new tax impact.

During the license renewal term, the primary tax-related impact would be the continuation of tax payments that WCGS is currently making to local jurisdictions. WCGS currently provides 45 percent of Coffey County's revenues and 63 percent of Burlington School District's revenues. A new impact would also result from the increase in tax payments resulting from improvement made at the WCGS during the final refurbishment period. Thus, tax revenues would increase in absolute terms but may remain constant or decrease as a percentage of total revenues of the taxing jurisdictions. Based on current conditions, WCGS tax revenues—the continuing and additional payments combined—are expected to continue to make up a large share of the total revenues of the county and the school district.

C.4.7.4 Public Services

C.4.7.4.1 Impacts from Plant Construction and Operation

In terms of public services, WCGS affects several surrounding communities and school districts, especially Coffey County and the incorporated cities of New Strawn and Burlington. These incorporated cities maintain certain utilities and their streets, and Burlington has a police department. The majority of services, however, are provided

at a county or state level, and recreational facilities for both communities are provided through a district recreation commission. WCGS also has affected the schools in Burlington, Lebo/Waverly, and Leroy, and there have been some effects on the city of Emporia in neighboring Lyon County. There have also been significant impacts on transportation north of the plant.

Since operations at WCGS began, existing facilities have been upgraded in the area, and other new ones have been built. This has happened especially in the areas of education, transportation, public safety, recreation, and public utilities. Information pertaining to expenditures is discussed in detail in Section C.4.7.3.

Education

WCGS is located in the Burlington School District, Unified School District 244, but the presence of the facility also affects the nearby school districts in Lebo/Waverly and Leroy. Before the construction of WCGS, the Burlington School District maintained three schools: an elementary, a middle, and a high school. The Burlington superintendent reported that the plant's construction had noticeable impacts on district enrollment, as it did in Lebo/Waverly and Leroy. Unlike the two neighboring school districts, there was no large drop in enrollment in Burlington after construction of WCGS was complete.

The superintendent in the Lebo/Waverly school district, Unified School District 243, indicated that a period of higher enrollment lasted for 6 to 7 years, but it was followed by a sharp drop in the number of students. Enrollment at Leroy also grew during WCGS's construction but has dropped nearly 19 percent since its completion. However, the drop in enrollment was due

more to the loss of jobs in nearby oil fields over the last 5 years and was not as bad as had been predicted.

Operations at WCGS have had a small effect on enrollment in the districts. Maintenance and refueling activities at WCGS also have caused only small impacts on enrollment in all of the school districts. However, as noted in Section 4.7.3, tax funds from WCGS have been very important to the Burlington School District, allowing an addition onto the elementary school and new buildings for the middle and high schools.

Transportation

Informants in Burlington and the small town of New Strawn reported that the construction of WCGS did not affect traffic or street repair in these communities. However, the city manager in Emporia stated that traffic problems increased in his city during construction. Roads and bridges in the area were unimproved and in a state of disrepair before construction. Revenues from WCGS have since funded the repairs of roads and bridges, and they are now in good condition. This was made possible by a shift in road funding from the townships to the county. Burlington's city manager reported that the county also had been assisting the city with street maintenance funds.

Although there were minor impacts in the areas mentioned above, traffic on the highways leading toward the plant from the west, north, and northeast experienced large impacts. The Coffey County engineer estimated that, during construction, the surge in traffic at shift changes caused congestion as far away as 100 km (60 miles). Construction workers who commuted into Coffey County lived in various larger cities,

such as Emporia, Topeka, Ottawa, and Olathe. Traffic from these communities approached WCGS mainly on two highways, Interstate 35 and U.S. 75. The main access to the plant was from the intersection of these two highways, about 24 km (15 miles) north of the plant. Traffic was bottlenecked from this intersection south almost to New Strawn, where the plant road intersects with U.S. 75.

Following plant construction, the on-site work force was reduced substantially, and improvements were made to roads leading to and from the plant. Accordingly, large plant-related traffic impacts no longer are experienced in the study area, either during normal operations or during periodic plant outages for refueling (with an average of 640 additional workers) although traffic is noticeably heavier during outages than during normal operations, so that there are small to moderate impacts.

Public Safety

The city of Burlington provides police protection to its citizens and formerly had a volunteer fire department. In January 1990, the fire department was put under the control of county, which has greater financial resources. Coffey County will also build and maintain a new volunteer fire station in New Strawn in the near future.

New Strawn does not provide police protection, but Emporia provides police protection and has a paid fire department. No informant reported an increase in demands on fire protection in any community since WCGS's construction began. One respondent did state that problems with law enforcement in Emporia existed during the construction period, but this was not reported elsewhere.

No informant reported impacts on public safety from operations at WCGS or from refurbishments at the plant.

Social Services

Social services and health programs in Burlington and New Strawn are provided by the state and Coffey County, as is the case generally in Emporia. No informant reported impacts from the construction at WCGS. Beginning in 1984 the Lyon County Health Department had increased demands, but this was attributed to other factors, not to Wolf Creek's operations. No impacts were reported from refurbishment activities.

Public Utilities

Burlington's public utilities experienced noticeable impacts during WCGS's construction. The city provides water, sewage disposal, and electricity to residents, and these were noticeably affected. One informant reported that these services were expanded during construction. However, the city manager stated that utilities were well enough established at the time construction began that there were no significant effects because of WCGS's demands.

New Strawn provides water to its residents, and the water system was affected more during construction than any other service of New Strawn because the large influx of construction personnel put great demands on the water system. A new water plant was necessary, regardless of the employees' presence, so a new one was built. Property taxes and water bills paid by the WCGS workers contributed substantially to its funding.

The city of Emporia has provided water, sewage treatment, and refuse disposal for residents since before construction began at

WCGS. No informant reported large impacts on these services during the plant's construction.

The cities of Burlington, New Strawn, and Emporia report no impacts on city services as a result of operations and refurbishments at WCGS.

Tourism

The construction and operation of WCGS has had small effects on tourism in the area. No one reported major tourist activities in Burlington before the construction of WCGS began, but one informant stated that during construction the plant was open to the public often, that many people visited it, and that it is still open occasionally.

Operations at the plant also have encouraged tourism, both directly and indirectly. Tour buses make stops at the plant and its education center. In-migrants are credited with the survival of a puppet factory, another tourist attraction in Burlington. Several sites in and near Emporia may be developed in the future for increased tourism. The combination of these factors in Lyon County resulted in the formation of a convention and visitor's bureau in 1984 and the creation of a bed tax in Emporia; however, overall effects have not been significant to date. The Emporia Convention and Visitor's Bureau reports that the plant at WCGS has not resulted in a decrease in tourism.

Recreation

During construction, there were small impacts on public sports leagues and facilities in Burlington and New Strawn. New Strawn, as part of the Burlington School District, is also in the jurisdiction of the Burlington Recreation Commission.

Recreation in Emporia experienced moderate effects from the construction of WCGS. The Emporia Recreation Commission noted an increase in participation and a definite difference in recreational programs during that time; after construction workers left, cutbacks had to be made.

Recreation in Burlington has changed a great deal since WCGS began operating; most of the plant's impacts have been monetary. One respondent reported that funds from the plant had brought about the high school's new football and track facilities and that these facilities are used heavily, boosting retail business as well (S. Smith 1990). Burlington's recreation center, similarly financed, is a welcome amenity according to several sources. It was also noted by two informants that the cooling pond at WCGS would be a welcome addition to recreational facilities in the area, but the reservoir is not open to the public at this time.

There were no indications that operations and maintenance activities affect recreation in Burlington, and there were reports of insignificant impacts on Emporia's recreation programs. For instance, WCGS visitors and employees frequent the golf course, and organized recreational activities have slight increases during outages.

C.4.7.4.2 Predicted Impacts of License Renewal

Based on the estimated 2273 direct workers required during peak refurbishment, the staff estimates that 163 direct workers and 39 indirect workers will migrate with their families to Coffey County (Section C.4.7.1.2). The number of children accompanying these workers is estimated using the Kansas average family size (3.08)

and assuming that all families include two adults. Children are expected to be evenly distributed in age from ≤ 1 to 18 years. Assuming that 72.2 percent of these children are school age (5 to 18 years), there will be an average of 0.78 school-age children per in-migrating family, or a total of 158 new students in Coffey County, or about 12 per grade. This represents a 8.9 percent increase above the projected number of school-age children in Coffey County in 2024 (assuming the 1990 age distribution of the population). This considerable increase could easily require additional staff, might require temporary classrooms or conversions of facility use, and may result in moderate to large impacts to education.

An analysis of the projected BWR bounding case work force (1500 persons) was conducted to determine if a smaller work force would result in a lesser impact. (This is a hypothetical scenario because ANO is a PWR.) The 133 in-migrating direct and indirect workers who bring their families to Coffey County would be accompanied by 104 school-age children (or 8 per grade). This would result in a 5.8 percent increase in the number of school-age children in Coffey County in 2025 and could cause moderate impacts, especially if the children are concentrated geographically (e.g., in Burlington).

An analysis of potential impacts to education under the typical work force scenario (1017 workers) finds that there would be 89 direct and indirect workers migrating to Coffey County with their families. The associated 69 new school-age children (or 5.5 per grade level) would result in a 3.8 percent increase in the projected number of school-age children in Coffey County in 2025. This increase in enrollment will likely cause small impacts, but moderate impacts to the education system could result if the students

are concentrated geographically or if the facilities and classes are already at their peak capacity.

During the construction of WCGS, impacts on social services and tourism were insignificant. Because refurbishment would bring in fewer people than did the initial construction (2329), any future impacts to these public services would be small. (Coffey County's 1984 population was 9001 excluding WCGS construction-related in-migration.)

Public safety in Coffey County, which has been affected fiscally by WCGS, should also see small changes during the refurbishment period. Recreation, which experienced moderate impacts during the construction of WCGS, would probably experience only small impacts during refurbishment in 2024 because the recreation facilities themselves have been significantly improved since WCGS construction. A 9.1 percent increase in population may result in small to moderate impacts to public utilities.

Transportation effects hinge on three factors: the number of workers, the state of the roads, and the number of access points. Currently, one major access point leads into WCGS via a two-lane road. Based on the level of impacts that occurred during original plant construction, it is expected that the use of local roads by the peak refurbishment work force could result in large transportation impacts, despite road improvements made after initial construction.

During the license renewal term, only small impacts are expected for any public service, including transportation.

C.4.7.5 Off-Site Land Use

This section describes the off-site land-use impacts of the construction, operation, and license renewal of WCGS. The discussion of impacts is primarily concerned with land use in the immediate vicinity of the plant, but impacts to Coffey County are described where appropriate. Land-use impacts are examined for two time periods. First, Section C.4.7.5.1 identifies the land-use impacts of WCGS's construction and operation. Next, Section C.4.7.5.2 projects the land-use impacts of WCGS's refurbishment period based on the impacts that occurred during the plant's construction. Also, Section C.4.7.5.2 projects the land-use impacts of the plant's license renewal term based on the impacts that have occurred during operations. Information sources for this report include the *Final Environmental Statement Related to Construction of Wolf Creek Generating Station, Unit 1* (NUREG-75/096); the *Final Environmental Statement Related to the Operation of Wolf Creek Generating Station, Unit 1* (NUREG-0878); and interviews with key sources of information in Coffey County. Section C.4.1.5 describes the methods used to assess and project land-use impacts for all case study plants.

C.4.7.5.1 Impacts from Plant Construction and Operation

WCGS and its cooling lake were built on 3973-ha (9818-acre) tract of land near Burlington. The cooling lake inundated approximately 2100 ha (5100 acres) of land, and the actual plant site, including the lake's dam and dikes, covers approximately 80 ha (200 acres). Before the plant's construction, the land had been used almost exclusively for agriculture and livestock grazing, although 25 farm-related homes were on the site. The general area in the plant's vicinity

was very rural, and agriculture, livestock grazing, and low-density, farm-related residences were the primary land uses. There were only two small industries (a total of 33 employees) and some storage facilities (for petroleum products, grains, and fertilizer) within 8 km (5 miles) of the plant site at the time construction began. The town of Burlington, about 5.6 km (3.5 miles) southwest of the plant, was primarily a rural residential town with little commercial and almost no industrial land use (NUREG-75/096; NUREG-0878).

WCGS's construction had significant impacts on land use in the vicinity of the plant. Part of the impact included removing 25 homes and relocating some federal-aid secondary-route roads. Another immediate impact was on property ownership. In an effort to avoid subdividing previous owners' property beyond economic usefulness, the Kansas Gas and Electric Company purchased entire tracts of land, refusing to purchase only portions of an owner's property. This meant that the company acquired a great deal of excess land for the WCGS site. The land acquisition, the plant's construction, and the lake's inundation involved removing over 3600 ha (8800 acres) of agricultural and range land from production. There was some concern, before construction, that removing the agricultural and range land from production would have negative effects on the local economy. However, the impacts to range land have been somewhat alleviated by the fact that the Kansas Gas and Electric Company leases much of its excess property as range land to area farmers. In addition, the impacts of WCGS's operation, discussed below, have more than compensated for the local economy's loss of productive agricultural land (NUREG-75/096).

The plant's construction had moderate impacts on land use elsewhere in Coffey

County. Informants indicated that land use in some of the towns, particularly Burlington and New Strawn, was temporarily affected by the presence of the unusually large construction work force (approximately 5500 workers were on-site during the peak construction year). In 1984, construction-related population growth accounted for as much as 20.5 percent of Coffey County's total population. The primary impact of such growth involved the construction of temporary housing and the influx of mobile homes to provide housing for the construction workers. Informants felt that the number of mobile homes that came into the area was too great for the local mobile home parks to accommodate and that this had negative effects on some of the parks in Burlington and New Strawn. These effects were temporary, however, as most of the workers took their mobile homes with them as they left the area when the plant's construction was completed. Also, the presence of such a large construction force attracted some commercial and service businesses to Burlington. However, most of these were temporary businesses that moved into vacated buildings in Burlington when the plant's construction began and moved out of town when construction was completed. Overall, the influx of construction workers had only temporary land-use impacts and did not create permanent changes in land-use or development patterns in Coffey County (NUREG-75/096).

Operations at WCGS have had only minimal direct land-use impacts on Coffey County. Key sources indicated that the plant's presence had not been a deterrent to residential development. Conversely, the informants felt that the plant's operation had not directly encouraged residential development in Coffey County. This is because half the operations work force

resides outside of Coffey County, with many workers commuting from Emporia and Ottawa. The plant's presence also has had neutral impacts in terms of directly attracting support industries and commercial growth to the county.

However, WCGS's operation has had large indirect impacts on land use in Coffey County. The plant's property tax payments have allowed the county to lower its property tax rates while upgrading its provision of municipal services. Coffey County also has used much of its tax revenue from the plant to purchase industrial buildings and machinery. The county buys the building or the machinery and then leases it at a discount to the company on a lease-purchase basis. The company benefits by paying less for facilities and equipment, and the county benefits by attracting industrial development. According to key sources, the combination of low property taxes, above-average municipal services, and relatively low plant and equipment costs has been successful in attracting small and medium-sized industries to Coffey County.

WCGS's positive contributions to the county's overall quality of life also serve as a tool in recruiting industries. The tax base, employment, and salaries that the nuclear plant provides have encouraged commercial development, particularly in the incorporated towns in Coffey County, and have helped make the region's economy more stable. Key sources felt that the plant's tax payments were responsible for improving the county's hospital, roads, sewers, schools, and recreation facilities and that these improvements were a selling point to industrial prospects. Also, informants felt that the plant had brought a more highly educated, technical work force to the county and that the workers would continue to

support the types of community improvements that would be attractive to industries.

Since WCGS's construction, industries have begun to locate in Burlington and, more recently, in Waverly, Lebo, and Leroy. Although most of the industries are small, their presence does create changes in the county's land-use and development patterns. Burlington, a town that had only two small rural industries when WCGS's operation began, now has two industrial parks. The second industrial park attracted Tricon Industries, a company that provides approximately 500 jobs in producing fiberglass vaults for communications equipment. Although Coffey County is still rural, with agriculture as its primary land use, WCGS's tax payments and overall positive contributions to the community's quality of life have enabled the county to attract significant industrial development for the first time. This represents a trend away from the county's traditional rural land-use pattern, as more agricultural and range land is converted to industrial uses. Overall, informants felt that the nuclear plant's land-use impacts on Coffey County had been very positive.

C.4.7.5.2 Predicted Impacts of License Renewal

With the population increase projected for Coffey County, the direct land-use impacts of WCGS's refurbishment are expected to be moderate. Using the bounding case work force scenario, refurbishment-related population growth is projected to represent a 9.1 percent increase in the county's projected population in 2025. However, the new impacts are likely to be much smaller than those that occurred during the construction-related growth peak of 20.5 percent in 1984. The influx of

refurbishment workers might cause some temporary housing shortages; however, based on what occurred during the plant's construction, it is not likely that the shortages would result in any new large-scale residential development or changes in land-use patterns.

An analysis of the projected 1500-person BWR bounding case work force was conducted to determine whether a smaller work force would result in a lesser impact to land use. The in-migrating population associated with a BWR bounding case work force would be 526, or a 6.0 percent increase in Coffey County's projected population in 2024. This would result in moderate impacts to land use.

An analysis of potential impacts to land use under the typical work force scenario (1017 workers), finds that the projected in-migrating population of 353 (or a 4 percent increase in Coffey County's 2024 population) would likely result in only small impacts to land use.

Coffey County is still predominantly rural, and land in the plant's immediate vicinity will be used for agriculture and livestock grazing, as it has been during the plant's operation. Local officials expect some small-scale industrial and commercial growth in the county's incorporated towns, particularly in Burlington and New Strawn. However, the nuclear plant's presence is not expected to attract support industries or commercial development directly and is likely to neither encourage nor deter residential development.

Because WCGS is located in a rural area that depends largely upon agriculture for its economic stability and because the nuclear plant and its property account for over 90 percent of Coffey County's taxable

assessed valuation, the new indirect land-use impacts of WCGS's license renewal term are expected to be large. As during operations thus far, WCGS's tax payments would continue to allow Coffey County to provide above-average municipal services with relatively low property tax rates. Sources indicated that the plant's tax payments had allowed the county to upgrade its services and provide amenities that improved residents' overall quality of life. They noted that some plant staff who had chosen to live in larger communities outside Coffey County when operations began were now moving into the county as a result of its above-average services and amenities. If this trend continues, a greater proportion of WCGS's plant staff would live in Coffey County in the future. It is expected that this in-migration would result in some additional residential development, especially in Burlington, and that this development could create changes in the county's land-use pattern.

Also, because of WCGS's tax payments, the county would be able to continue its successful economic development program of providing lease-purchase options for prospective industries' plant and equipment needs. By attracting small and medium-sized industries to the area, these benefits also would promote commercial and residential growth and further change Coffey County's land-use pattern. Although the county's land-use pattern is expected to remain predominantly agricultural, the new indirect impacts of WCGS's license renewal term would have large effects on land-use and development patterns in Coffey County.

C.4.7.6 Economic Structure

C.4.7.6.1 Impacts from Plant Construction and Operation

The construction and operation of WCGS have resulted in large economic impacts to Coffey County. First, they have directly increased employment and income for county residents employed in the construction and operation of the plant. Second, direct employment and income have generated local expenditures resulting in indirect employment and income, and increased tax revenues from WCGS have helped provide the necessary infrastructure for attracting new business into the county. Table C.86 presents the estimated employment and income effects of WCGS's operation for residents of Coffey County.

As the table indicates, the economic effects of operating WCGS are very important to the local community. One indication of the impact on the local economy is the increase in per capita income compared to that in neighboring counties. For instance, from 1975 to 1990, Coffey County per capita income increased by 52 percent. By contrast, in the neighboring counties of Lyon, Osage, and Anderson, per capita income increased by 29, 35, and 43 percent, respectively, over the same time period. Over this same period, Coffey County employment by place of business increased by 75 percent, whereas combined employment in the neighboring counties increased by only 22 percent.

C.4.7.6.2 Predicted Impacts of License Renewal

Tables C.87 and C.88 indicate that although the economic effect of WCGS on Coffey County would decline in relative terms, it would still be a crucial component of county

employment during refurbishment and after license renewal.

The main impact of license renewal at WCGS would be the continued employment and income benefits of the plant's operation. The benefits should be similar in size to those that existed in 1989, but the relative importance of the benefits would decline because Coffey County's economy is projected to grow in other sectors.

The work force scenario detailed in Section C.3.1 was used to estimate the employment and economic effects of refurbishment at WCGS. Table C.87 shows the total direct and indirect plant-related employment of study area residents during refurbishment. It is projected that WCGS would employ 455 county residents as refurbishment workers in 2024 (Section C.4.7.1.2). Indirect employment that would result from purchases of goods and services during refurbishment is projected to create 108 additional jobs for Coffey County residents. Together, WCGS-related direct and indirect employment is projected to total 563 workers in Coffey County. This is a moderate impact, as those workers represent approximately 6.8 percent of Coffey County's total projected employment in 2024.

Relatively few new plant-related jobs would be created at WCGS during the license renewal term. Nearly all plant-related employment (and associated impacts) expected during that time period would represent a continuation of employment (and impacts) from past operations. Table C.87 shows the impact of the increased labor requirements at WCGS after 2025. The license renewal term work force for WCGS would require an estimated 60 additional workers; 30 are projected to be Coffey County residents. In addition, an

estimated 23 indirect jobs are projected to be created for county residents by license renewal. With the continued effects of the plant's current employment and the additional employment to be created, total direct and indirect license renewal term employment is projected to be 575, or 7.1 percent of Coffey County's total employment in 2025. This employment level represents a moderate impact.

C.4.7.7 Historic and Aesthetic Resources

This section describes the impacts that the construction and operation of the Wolf Creek Generating Station have had on historic and aesthetic resources and projects the expected impacts of the plant's refurbishment and post-license renewal operations. Information sources include the *Final Environmental Statement Related to the Operation of Wolf Creek Generating Station, Unit 1* (NUREG-0878) and interviews with key sources in Coffey County and elsewhere in Kansas.

C.4.7.7.1 Impacts from Plant Construction and Operation

The construction and operation of the Wolf Creek nuclear facility have had insignificant impacts to Coffey County's historic resources. According to the *Final Environmental Statement* (NUREG-0878), no listed natural or historic landmarks or sites are within 8 km (5 miles) of the plant. Since publication of the *Final Environmental Statement* in 1982, none has been added or identified as eligible for inclusion in the National Register of Historic Places or the National Registry of Natural Landmarks. At the time of the issuance of the *Final Environmental Statement*, the state historic preservation officer stated that no historic sites or buildings would be affected by the construction or operation of the Wolf Creek

power plant. Sources report that the plant's construction, operation, and community taxes have resulted in a slight indirect benefit to the community in terms of historic preservation (Sirico 1990; Reams 1990). Members of the construction and operating work forces have brought their own personal experiences of the benefits of historic preservation to the community. They have purchased some depressed properties of historic significance and restored them. Community taxes have helped fund the construction and operation of a new museum.

Numerous archaeological sites were identified before construction, and some were further investigated, but from the additional analyses it was concluded that none of the sites was significant enough to warrant nomination to the National Register. The transmission line corridors followed alignments purposely created in part to avoid archaeologically sensitive areas. A railroad spur built to facilitate construction at the power plant site threatened an archaeological site; the area was excavated before construction.

Surrounding the site is a low-density rural agricultural area. The plant relies on an artificial impoundment for cooling water; therefore, no strong, stark, towering cooling structure is needed among the flat to rolling farmlands. The sources reported no complaints or problems with the aesthetics of the plant or its effects on the aesthetic resources of the community.

C.4.7.7.2 Predicted Impacts of License Renewal

The impacts of refurbishment of the Wolf Creek plant on local historic and aesthetic resources are projected to be less than those minor ones experienced during the original

construction of the plant. However, determination of impacts to historic resources from refurbishment and license renewal term operations must be made through consultation with the SHPO.

C.5 ENDNOTES

1. The PWR conservative work force number used in this analysis is taken from a work force estimate provided by Science and Engineering Associates, Inc. (SEA), that differs slightly from SEA's work force estimate discussed in Chapter 2 and Appendix B. The slight difference would not affect the conclusions.
2. Estimates in Chapter 2 and Appendix B of additional work force required during license-renewal-term operations indicate that only one additional worker will be required on a continuous basis for maintenance and inspection activities. The more conservative figure (60 persons per unit) is used in the analysis to account for workers (contractors or rotating utility employees) who are not associated with refueling but may be on-site intermittently. The 60 persons per unit analysis represents an upper bound of the possible socioeconomic impacts.

C.6 REFERENCES

The references that follow are divided into three sections: Section C.5.1—printed material that is cited in the text; Section C.5.2—personal communications cited in the text; and Section C.5.3—final environmental statements on which the text has drawn but which are not specifically cited.

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C.7 TABLES

Table C.1 Sparseness and proximity measures used to classify potential case study sites

Sparseness	
<i>Category</i>	
Most sparse	1. <40 persons per square mile and no community with 25,000 or more persons within 20 miles
	2. 40 to 60 persons per square mile and no community with 25,000 or more persons within 20 miles
	3. 60 to 120 persons per square mile or less than 60 persons per square mile with at least one community with 25,000 or more persons within 20 miles
Least sparse	4. ≥120 persons per square mile within 20 miles
Proximity	
<i>Category</i>	
Not in close proximity	1. No city with 100,000 or more persons and <50 persons per square mile within 50 miles
	2. No city with 100,000 or more persons and between 50 and 190 persons per square mile within 50 miles
	3. One or more cities with 100,000 or more persons and <190 persons per square mile within 50 miles
In close proximity	4. ≥190 persons per square mile within 50 miles

Source: Adapted from NUREG/CR-2239.

Note: Metric equivalents are as follows:

1 square mile = 2.6 km²

20 miles = 32 km

50 miles = 80 km

Table C.2 Population classification of each potential case study site

Low	Arkansas Big Rock Point Cooper Hatch Wolf Creek
Medium	Bellefonte Crystal River Diablo Canyon Oconee St. Lucie
High	Calvert Cliffs D. C. Cook Indian Point Nine Mile Point Peach Bottom Rancho Seco San Onofre Surry Three Mile Island

Source: Staff computations.

Table C.3 Case study sites

Site	Population size	Location	Year(s) licensed
Arkansas	Low	Arkansas	1974, 1978
Wolf Creek	Low	Kansas	1985
Diablo Canyon	Medium	California	1984, 1985
Oconee	Medium	South Carolina	1973, 1973, 1974
D. C. Cook	High	Michigan	1974, 1977
Indian Point	High	New York	1973, 1976
Three Mile Island	High	Pennsylvania	1974

Source: Staff computations; NUREG-0020, vol. 9.

Table C.4 Current^a operating-period employment at nuclear power plants

Employment	One-unit plants	Two-unit plants	Three-unit plants
Minimum	201	467	1750
Maximum	1800	2500	3340
Mean	832	1247	2404
(Number of plants)	(34)	(28)	(4)

^aApproximately half the respondents reported data for 1989 and half for 1990.
Source: ORNL/NUMARC survey of all utilities (see Section C.1.3).

Table C.5 Changes in mean operating-period employment at nuclear power plants over time

Time	One-unit plants ^a	Two-unit plants ^a	Three-unit plants ^a
1989/1990 ^b	832 (34)	1247 (28)	2404 (4)
1985-1989	841 (30)	1094 (26)	2095 (4)
1980-1984	447 (19)	946 (21)	1078 (3)
1975-1979	233 (17)	515 (16)	699 (3)

^aNumber in parentheses indicates number of plants providing data.

^bApproximately half the respondents reported data for 1989 and half for 1990.
Source: ORNL/NUMARC survey of all utilities (see Section C.1.3).

Table C.6 Employment, cost, and time associated with typical planned outage at nuclear power plants

Employment	Total no. of workers	Cost (\$ × 10 ⁶)	Length of outage (days)
Minimum	60	4.5	32
Maximum	2600	56.5	139
Mean	783	21.7	76
(Number of plants)	(58)	(39)	(62)

Source: ORNL/NUMARC survey of all utilities (see Section C.1.3).

Table C.7 Employment, cost, and time associated with an in-service inspection outage at nuclear power plants

Employment	Total no. of workers	Cost (\$ × 10 ⁶)	Length of outage (days)
Minimum	35	1.6	16
Maximum	1986	40.0	325
Mean	734	22.0	107
(Number of plants)	(23)	(14)	(27)

Source: ORNL/NUMARC survey of all utilities (see Section C.1.3).

Table C.8 Employment, cost, and time associated with largest single outage at nuclear power plants

Employment	Total no. of workers	Cost (\$ × 10 ⁶)	Length of outage (days)
Minimum	80	5.4	43
Maximum	3000	210.0	1,004
Mean	1223	53.7	199
(Number of plants)	(45)	(30)	(41)

Source: ORNL/NUMARC survey of all utilities (see Section C.1.3).

Table C.9 Current^a assessed value of nuclear power plants (in dollars)

	One-unit plants	Two-unit plants	Three-unit plants
Minimum	8,309,867	16,619,733	40,514,729
Maximum	4,351,797,390	8,023,653,676	12,035,480,510
Mean	732,615,112	1,113,824,421	4,283,239,036
(Number of plants)	(23)	(21)	(4)

^aApproximately half the respondents reported data for 1989 and half for 1990.

Source: ORNL/NUMARC survey of all utilities (see Section C.1.3).

Table C.10 Past assessed value of nuclear power plants (in dollars)

Value	One-unit plants		Two-unit plants		Three-unit plants	
	1980	1985	1980	1985	1980	1985
Minimum	6,542,066	7,957,867	13,084,133	15,915,733	341,222,806	1,147,319,438
Maximum	460,383,107	2,195,586,755	4,309,013,892	6,645,073,248	6,463,520,838	9,967,609,872
Mean	137,952,092	409,168,905	497,568,490	943,272,817	2,454,988,141	4,281,860,682
(Number of plants)	(17)	(19)	(19)	(19)	(3)	(3)

Source: ORNL/NUMARC survey of all utilities (see Section C.1.3).

Table C.11 Current^a taxes paid by nuclear power plants (in dollars)

	One-unit plants	Two-unit plants	Three-unit plants
Minimum local	19,000	16,617	5,510,003
Minimum state	229,000	42,183	10,215,660
Minimum total	19,000	750,000	5,510,003
Maximum local	33,786,685	34,132,316	91,262,791
Maximum state	37,540,707	92,792,182	139,118,273
Maximum total	52,000,000	92,792,182	139,118,273
Mean local	8,740,879	8,172,250	48,386,397
Mean state	14,600,201	28,011,507	74,701,967
Mean total	12,647,941	19,360,839	69,066,815
(No. paying local taxes)	(21)	(19)	(2)
(No. paying state taxes)	(6)	(9)	(2)
(Total no. reporting)	(29)	(23)	(4)

^aApproximately half the respondents reported data for 1989 and half for 1990.
Source: ORNL/NUMARC survey of all utilities (see Section C.1.3).

Table C.12 Past taxes paid by nuclear power plants (in dollars)

	One-unit plants		Two-unit plants		Three-unit plants	
	1980	1985	1980	1985	1980	1985
Minimum local	77,196	21,000	11,624	13,765	10,373,174	30,059,769
Minimum state	182,564	184,000	35,355	37,813	4,265,285	—4,589,278
Minimum total	529,692	21,000	617,000	695,000	13,221,211	34,649,047
Maximum local	9,832,452	16,273,095	10,800,000	27,969,568	10,373,174	30,059,769
Maximum state	33,266,428	37,487,911	66,532,857	75,299,185	68,205,671	112,948,777
Maximum total	33,343,625	37,615,236	66,687,249	75,299,185	68,205,671	112,948,777
Mean local	3,720,242	6,240,207	4,156,061	7,527,656	10,373,174	30,059,769
Mean state	12,039,844	12,962,231	17,264,470	25,825,159	36,235,478	58,769,028
Mean total	5,184,430	8,400,823	10,807,676	17,441,883	32,021,780	—61,238,849
(No. paying local taxes)	(15)	(19)	(16)	(16)	(1)	(1)
(No. paying state taxes)	(3)	(5)	(8)	(8)	(2)	(2)
(Total no. reporting)	(20)	(25)	(21)	(21)	(3)	(3)

Source: ORNL/NUMARC survey of all utilities (see Section C.1.3).

Table C.13 Population growth associated with Arkansas Nuclear One: Pope County, Arkansas, 1970-1989

Year	Work force			Project-related in-migrant population ^a	County's total population ^b	Increase as % of total
	Construction	Operations	Total			
1970	420	0	420	846	28,607	3.0
1974	1,100	248	1,348	2,756	33,200	8.3
1975	928	293	1,221	2,576	33,600	7.7
1980	0	462	462	682	39,021	1.7
1985	0	1,984	1,984	2,736	42,109	6.5
1989	0	2,205	2,205	3,418	45,883 ^c	7.4

^aIncludes both direct and indirect workers and their families.

^bPopulation assumed to grow at a constant annual rate between known points

^c1990 U.S. Census figure used.

Sources: NUREG/CR-2749, vol 1, pp. 20, 26, and 86; AP&L 1990; ORNL staff computations.

Table C.14 Estimated plant-related population growth in Pope County, Arkansas, 1989**Direct growth**

Number of direct workers	2205
Number of study area residents (90% of total)	1985
Number of in-migrants (56.2% of residents)	1116
Number of in-migrants with families (60%)	670
Average family size	× 3.06
Total in-migrants plus families	2050
Number of in-migrants without families (40%)	+ 446
Total direct growth	2496

Indirect growth

Ratio indirect/direct jobs	0.39
Number of indirect workers	860
Number of study area residents (96% of total)	826
Number of in-migrants (55% of residents)	454
Number of in-migrants with families (50%)	227
Average family size	× 3.06
Total in-migrants plus families	695
Number of in-migrants without families (50%)	+ 227
Total indirect growth	922

Total growth

Total direct growth	2496
Total indirect growth	+ 922
Total estimated plant-related growth	3418

Sources: Number of direct workers and percentage of study area residents from AP&L 1990. Average family size from 1990 U.S. Census of Population. Other data from NUREG/CR-2749, vol. 1, pp. 56-86; ORNL staff computations.

Table C.15 Projected refurbishment-related population growth in Pope County, Arkansas, 2013

Direct growth	
Number of direct workers	2273
Number of study area residents (65% of total)	1477
Number of in-migrants (56.2% of residents)	830
Number of in-migrants with families (60%)	498
Average family size	× 3.06
Total in-migrants plus families	1524
Number of in-migrants without families (40%)	+ 332
Total direct growth	1856
Indirect growth	
Ratio indirect/direct jobs	0.208
Number of indirect workers	473
Number of study area residents (96% of total)	454
Number of in-migrants (54.2% of residents)	246
Number of in-migrants with families (50%)	123
Average family size	× 3.06
Total in-migrants plus families	376
Number of in-migrants without families (50%)	123
Total indirect growth	499
Total growth	
Total direct growth	1856
Total indirect growth	400
Total projected refurbishment-related growth	2355

Sources: Direct workers from SEA 1994. Average family size from 1990 U.S. Census of Population. Other data from NUREG/CR-2749, vol. 1, pp. 56-86; ORNL staff computations.

Table C.16 Projected plant-related population growth in Pope County, Arkansas, during the license renewal term

Direct growth	
Number of direct workers	120
Number of study area residents (90% of total)	108
Number of in-migrants (56.2% of residents)	61
Number of in-migrants with families (60%)	37
Average family size	× 3.06
Total in-migrants plus families	113
Number of in-migrants without families (40%)	+ 24
Total direct growth	<u>137</u>
Indirect growth	
Ratio indirect/direct jobs	0.39
Number of indirect workers	47
Number of study area residents (96% of total)	45
Number of in-migrants (55% of residents)	25
Number of in-migrants with families (50%)	13
Average family size	× 3.06
Total in-migrants plus families	40
Number of in-migrants without families (50%)	+ 12
Total indirect growth	<u>52</u>
Total growth	
Total direct growth	137
Total indirect growth	+ 52
Total estimated operations-related growth	<u>189</u>

Sources: Direct workers from NRC work force estimates (1989). Average family size from 1990 U.S. Census of Population. Other data from NUREG/CR-2749, vol. 1, pp. 56-86; ORNL staff computations.

Table C.17 Arkansas Nuclear One (ANO) station assessed value and taxes paid to Pope County, 1968–1989, in current dollars

Year	Assessed value (\$)		ANO valuation as % of county valuation	Millage	Taxes paid by ANO (\$)
	Pope County	ANO			
1968	17,100,000	930,053	5.4	.057	53,093
1972	52,607,000	25,817,219	49.1	.064	1,652,302
1976	136,640,000	100,589,373	73.6	.059	5,934,773
1980	193,993,250	142,718,270	73.6	.0107	1,529,051
1985	334,683,819	173,679,771	51.9	.0091	1,583,831
1989	410,290,842	189,419,497	46.2	.0064	1,204,632

Sources: NUREG/CR-2749, vol. 1; Duval 1990; Rye 1990.

Table C.18 Arkansas Nuclear One (ANO) Station project revenue impact to Russellville School District

Year	Total assessed valuation (\$ × 10 ⁶)	School district revenues (\$ × 10 ³)			ANO revenues as % of	
		Total	Property taxes	ANO taxes	Property taxes	Total revenues ^a
1968	14.9	NA ^b	745	46.5	6.2	NA
1970	19.9	NA	995	189.2	19.0	NA
1972	44.3	2600	2215	1290.9	58.3	49.7
1974	81.7	4958	4085	3246.6	79.5	65.5
1976	125.6	7898	6280	5029.5	80.1	63.7
1977	142.2	8740	7110	5739.6	80.7	65.7
1980	NA	NA	NA	6950.2	NA	NA
1985	NA	NA	NA	6816.1	NA	NA
1989	341.1	12,574	7675	5222.3	68.0	41.5

^aTotal revenues consist of revenues from property assessments and state and federal funding sources.

^bNA = not applicable.

Source: NUREG/CR-2749, vol. 1; Pope County 1980, 1985, and 1989; Rye 1990; Duval 1990.

Table C.19 Estimated economic effects of Arkansas Nuclear One on Pope County

	1974	1978	1989
Employment			
Direct basic	889	772	1,985
Indirect	<u>75</u>	<u>127</u>	<u>826</u>
Total	964	899	2,811
Percentage of study area employment	6.4	5.3	11.6
Income (1989 \$)			
Direct	20,679,000	26,656,000	73,713,000
Indirect	<u>1,886,000</u>	<u>3,421,000</u>	<u>12,446,000</u>
Total	22,565,000	30,077,000	86,159,000
Percentage of study area income	7.5	7.8	14.3

Source: For 1974 and 1978 estimates, NUREG/CR-2749, vol. 1. The 1989 estimate is based on the approach used in the Mountain West study.

Table C.20 Projected employment effects of Arkansas Nuclear One (ANO) refurbishment on Pope County, 2013

Refurbishment direct employment	1477
Refurbishment indirect employment	454
Total ANO-related employment	<u>1931</u>
Percentage of Pope County employment	5.8

Source: ORNL staff computations based on the approach used in the Mountain West study (NUREG/CR-2749, vol. 1).

Table C.21 Projected employment effects of Arkansas Nuclear One license renewal on Pope County, 2013

Existing total direct and indirect plant-related employment	2811
Increase in direct employment	108
Increase in indirect employment	<u>45</u>
Total plant-related employment	2964
Percentage of Pope County employment	8.9

Source: ORNL staff computations based on the approach used in the Mountain West study (NUREG/CR-2749, vol. 1).

Table C.22 Population growth associated with D. C. Cook: Bridgman/Lake Township and Berrien County, 1970-1990

Year	Work force			Bridgman/Lake Township			Berrien County		
	Construction	Operations	Total	Project-related in-migrant population ^a	Area's total population ^b	Project-related population as % of total	Project-related in-migrant population ^a	County's total population ^b	Project-related population as % of total
1970	914	24	938	61	3,767	1.6	802	163,875	0.5
1972	2,377	148	2,525	175	3,782	4.6	2,193	167,000	1.3
1975	292	279	571	72	3,910	1.8	595	170,100	0.3
1980	0	746	746	81	4,514	1.8	644	171,267	0.4
1985	0	1,110	1,110	108	4,386	2.5	877	163,600	0.5
1990	0	1,252	1,252	141	4,627	3.0	1,109	161,378	0.7

^aIncludes both direct and indirect workers and families.

^bPopulation assumed to grow at constant annual rate between known points.

Sources: NUREG/CR-2749, vol. 4, p. 115; Indiana and Michigan Power Company 1990; U.S. Bureau of the Census 1990; ORNL staff computations.

Table C.23 Estimated plant-related population growth in Bridgman/Lake Township, Michigan, 1990

Direct growth

Number of direct workers	1252
Number of study area residents (10.6% of total)	133
Number of in-migrants (46% of residents)	61
Number of in-migrants with families (60%)	37
Average family size	× 3.16
Total in-migrants plus families	117
Number of in-migrants without families (40%)	+ 24
Total direct growth	<u>141</u>

Indirect growth

Ratio indirect/direct jobs	0.339
Number of indirect workers	424
Number of study area residents (3.5% of total)	15
Number of in-migrants (0% of residents)	0
Number of in-migrants with families (0%)	0
Average family size	× 3.16
Total in-migrants plus families	0
Number of in-migrants without families (0%)	+ 0
Total indirect growth	<u>0</u>

Total growth

Total direct growth	141
Total indirect growth	+ 0
Total estimated plant-related growth	<u>141</u>

Sources: Number of direct workers from Indiana and Michigan Power Company 1990. Average family size from 1990 U.S. Census of Population. Other data from NUREG/CR-2749, vol. 4, pp 88-115; ORNL staff computations

Table C.24 Estimated plant-related population growth in Berrien County, Michigan, 1990

Direct growth	
Number of direct workers	1252
Number of study area residents (80% of total)	1002
Number of in-migrants (46% of residents)	461
Number of in-migrants with families (60%)	277
Average family size	× 3.16
Total in-migrants plus families	875
Number of in-migrants without families (40%)	+ 184
Total direct growth	<u>1059</u>
Indirect growth	
Ratio indirect/direct jobs	0.339
Number of indirect workers	424
Number of study area residents (95% of total)	403
Number of in-migrants (5.5% of residents)	22
Number of in-migrants with families (60%)	13
Average family size	× 3.16
Total in-migrants plus families	41
Number of in-migrants without families (40%)	+ 9
Total indirect growth	<u>50</u>
Total growth	
Total direct growth	1059
Total indirect growth	+ 50
Total estimated plant-related growth	<u>1109</u>

Sources Number of direct workers from Indiana and Michigan Power Company 1990. Average family size from 1990 U S Census of Population. Other data from NUREG/CR-2749, vol 4, pp. 88-115; ORNL staff computations

Table C.25 Projected refurbishment-related population growth in Berrien County, Michigan, 2014

Direct growth	
Number of direct workers	2273
Number of study area residents (66% of total)	1500
Number of in-migrants (55.3% of residents)	830
Number of in-migrants with families (50%)	415
Average family size	× 3.16
Total in-migrants plus families	1311
Number of in-migrants without families (50%)	+ 415
Total direct growth	<u>1726</u>
Indirect growth	
Ratio indirect/direct jobs	0.366
Number of indirect workers	832
Number of study area residents (95% of total)	790
Number of in-migrants (5.4% of residents)	43
Number of in-migrants with families (60%)	26
Average family size	× 3.16
Total in-migrants plus families	82
Number of in-migrants without families (40%)	+ 17
Total indirect growth	<u>99</u>
Total growth	
Total direct growth	1726
Total indirect growth	99
Total projected refurbishment-related growth	<u>1825</u>

Sources: Direct workers from SEA 1994. Average family size from 1990 U.S. Census of Population. Other data from NUREG/CR-2749, vol. 4, pp. 88-115, ORNL staff computations.

**Table C.26 Projected refurbishment-related population growth in Bridgman/
Lake Township, Michigan, 2014**

Direct growth	
Number of direct workers	2273
Number of study area residents (5.4% of total)	123
Number of in-migrants (55.3% of residents)	68
Number of in-migrants with families (50%)	34
Average family size	× 3.16
Total in-migrants plus families	107
Number of in-migrants without families (50%)	+ 34
Total direct growth	<u>141</u>
Indirect growth	
Ratio indirect/direct jobs	0.366
Number of indirect workers	832
Number of study area residents (3.5% of total)	29
Number of in-migrants (0% of residents)	0
Number of in-migrants with families (0%)	0
Average family size	× 3.16
Total in-migrants plus families	0
Number of in-migrants without families (0%)	+ 0
Total indirect growth	<u>0</u>
Total growth	
Total direct growth	141
Total indirect growth	0
Total projected refurbishment-related growth	<u>141</u>

Sources: Direct workers from SEA 1994. Average family size from 1990 U.S. Census of Population. Other data from NUREG/CR-2749, vol. 4, pp. 88-115; ORNL staff computations.

Table C.27 Projected plant-related population growth in Berrien County, Michigan, during the license renewal term

Direct growth	
Number of direct workers	120
Number of study area residents (80% of total)	96
Number of in-migrants (46% of residents)	44
Number of in-migrants with families (60%)	26
Average family size	× 3.16
Total in-migrants plus families	82
Number of in-migrants without families (40%)	+ 18
Total direct growth	<u>100</u>
Indirect growth	
Ratio indirect/direct jobs	0.339
Number of indirect workers	41
Number of study area residents (95% of total)	39
Number of in-migrants (5.4% of residents)	2
Number of in-migrants with families (60%)	1
Average family size	× 3.16
Total in-migrants plus families	3
Number of in-migrants without families (40%)	+ 1
Total indirect growth	<u>4</u>
Total growth	
Total direct growth	100
Total indirect growth	+ 4
Total projected plant-related growth	<u>104</u>

Sources: Direct workers from NRC work force estimates (1989). Percentage of study area residents from Indiana and Michigan Power Company 1990. Average family size from 1990 U.S. Census of Population. Other data from NUREG/CR-2749, vol. 4, pp. 88-115; ORNL staff computations.

Table C.28 Projected plant-related population growth in Bridgman/Lake Township, Michigan, during the license renewal term

Direct growth	
Number of direct workers	120
Number of study area residents (10.6% of total)	13
Number of in-migrants (46% of residents)	6
Number of in-migrants with families (60%)	4
Average family size	× 3.16
Total in-migrants plus families	13
Number of in-migrants without families (40%)	+ 2
Total direct growth	<u>15</u>
Indirect growth	
Ratio indirect/direct jobs	0.339
Number of indirect workers	41
Number of study area residents (3.5% of total)	1
Number of in-migrants (0% of residents)	0
Number of in-migrants with families (0%)	0
Average family size	× 3.16
Total in-migrants plus families	0
Number of in-migrants without families (0%)	+ 0
Total indirect growth	<u>0</u>
Total growth	
Total direct growth	15
Total indirect growth	+ 0
Total projected plant-related growth	<u>15</u>

Sources: Direct workers from NRC work force estimates (1989). Percentage of study area residents from Indiana and Michigan Power Company 1990. Average family size from 1990 U.S. Census of Population. Other data from NUREG/CR-2749, vol. 4, pp 88-115; ORNL staff computations

Table C.29 Berrien County revenues (constant 1988 dollars)

Fiscal year	Property taxes	State aid	Charges for services	Other	Total
1967					
Amount (\$)	7,668,000	NA ^a	NA	NA	10,343,653
Percentage of total revenues	74.1				100
1972					
Amount (\$)	9,021,603	2,032,351	1,261,970	586,184	12,902,108
Percentage of total revenues	69.9	15.8	9.8	4.5	100
1978					
Amount (\$)	10,651,576	5,959,953	1,845,206	2,253,562	20,710,297
Percentage of total revenues	51.4	28.8	8.9	10.9	100
1988					
Amount (\$)	11,859,469	3,544,135 ^b	3,079,413	1,803,630	20,289,597 ^c
Percentage of total revenues	58.5	17.5	15.2	8.9	100

^aNA = not applicable.

^bThis state aid includes \$1,975,440 from income tax diversion.

^cThere was an unexplained discrepancy of \$2950 in audit report for the year ending December 31, 1988.

Sources: NUREG/CR-2749, vol. 4; Berrien County 1989.

Table C.30 Equalized assessed valuation of D. C. Cook Nuclear Plant as a percentage of total equalized assessed value for taxing jurisdictions

Jurisdiction	1967	1973	1976	1980	1988
Berrien County	0	5.7	12.6	20.7	21.5
Lake Township	0	79.7	86.7	90.0	90.6
Bridgman School District	0	68.9	79.9	82.9	88.0

Sources: NUREG/CR-2749, vol. 4; Schuller 1990; Stockman 1990; Winslow 1990.

Table C.31 Distribution of property tax payments from D. C. Cook to various taxing jurisdictions/recipients in 1989

	Millage	D. C. Cook's tax contribution at SEV ^a of \$531,797,266
County, general	5.3908	\$2,866,813
Lake Township, general	1.0000	531,797
Lake Michigan College	2.0414	1,085,611
Intermediate School District, general	0.1976	105,083
Intermediate School District, special	2.4827	1,320,293
Bridgman School District	8.376	4,454,334
Lake Township sewer	2.4	1,276,313
Lake Township water	1.9	1,010,415
Senior Center	0.2314	123,058
911 special phone assistant	0.1987	105,668
Drug abuse	0.12	63,816
Total levy	24.3386	12,943,201

^aSEV = state equalized value.

Sources: Millage rates, Schuller 1990; SEV for D. C. Cook Nuclear Plant, Stockman 1990

Table C.32 Estimated economic effects of D. C. Cook on Bridgman/Lake Township

	1972	1978	1990
Employment			
Direct basic	137	82	133
Secondary	<u>3</u>	<u>8</u>	<u>15</u>
Total	140	90	148
Percentage of study area employment	8.8	4.7	7.7
Income (1989 \$)			
Direct	6,312,000	2,878,000	4,951,000
Secondary	<u>70,000</u>	<u>114,000</u>	<u>234,000</u>
Total	6,382,000	2,992,000	5,185,000
Percentage of study area income	14.4	5.3	8.8

Source: For 1972 and 1978 estimates, NUREG/CR-2749, vol. 4 The 1990 estimate is based on the approach used in the Mountain West study.

Table C.33 Projected employment effects of D. C. Cook refurbishment, 2014

Area affected	Bridgman/Lake Township	Berrien County
Refurbishment direct employment	123	1500
Refurbishment indirect employment	<u>29</u>	<u>790</u>
Total D. C. Cook-related employment	152	2290
Percentage of study area employment	7.5	3.3

Source: ORNL staff computations based on the approach used in NUREG/CR-2749, vol. 4

Table C.34 Projected employment and economic effects of D. C. Cook license renewal, 2013

Area affected	Bridgman/Lake Township	Berrien County
Existing direct and indirect plant-related employment	148	1405
Increase in direct employment	13	96
Increase in indirect employment	<u>1</u>	<u>39</u>
Total plant-related employment	162	1540
Percentage of study area total employment	8.1	1.8

Source: ORNL staff computations based on the approach used in NUREG/CR-2749, vol. 4.

Table C.35 Population growth associated with Diablo Canyon: San Luis Obispo County, California, 1970-1990

Year	Work force			Project-related in-migrant population ^a	County's total population ^b	Project-related population as % of total
	Construction	Operations	Total			
1970	705	0	705	1,102	105,690	1.0
1975	2,116	0	2,116	3,308	126,500	2.6
1979	1,472	0	1,472	2,473	147,718	1.7
1985	0	764	764	980	192,218	0.5
1990	0	1,300	1,300	2,149	217,162	1.0

^aIncludes both direct and indirect workers and families.

^bPopulation assumed to grow at a constant annual rate between known points.

Sources: NUREG/CR-2749, vol. 5, p. 89; PG&E 1990; ORNL staff computations.

Table C.36 Estimated plant-related population growth in San Luis Obispo County, California, 1990

Direct growth

Number of direct workers	1300
Number of study area residents (89.2% of total)	1160
Number of in-migrants (70% of residents)	812
Number of in-migrants with families (66%)	536
Average family size	× 3.32
Total in-migrants plus families	1780
Number of in-migrants without families (33%)	+ 276
Total direct growth	2056

Indirect growth

Ratio indirect/direct jobs	0.64
Number of indirect workers	832
Number of study area residents (90% of total)	749
Number of in-migrants (5.0% of residents)	37
Number of in-migrants with families (66%)	24
Average family size	× 3.32
Total in-migrants plus families	80
Number of in-migrants without families (33%)	+ 13
Total indirect growth	93

Total growth

Total direct growth	2056
Total indirect growth	+ 93
Total estimated plant-related growth	2149

Sources: Number of direct workers and percentage of study area residents from PG&E 1990. Average family size from 1990 U.S. Census of Population. Other data from NUREG/CR-2749, vol. 5; ORNL staff computations.

Table C.37 Projected refurbishment-related population growth in San Luis Obispo County, California, 2023

Direct growth	
Number of direct workers	2273
Number of study area residents (85% of total)	1932
Number of in-migrants (72.5% of residents)	1401
Number of in-migrants with families (61.7%)	864
Average family size	× 3.32
Total in-migrants plus families	2868
Number of in-migrants without families (38.3%)	+ 537
Total direct growth	<u>3405</u>
Indirect growth	
Ratio indirect/direct jobs	0.64
Number of indirect workers	1455
Number of study area residents (95% of total)	1310
Number of in-migrants (5.2% of residents)	68
Number of in-migrants with families (100%)	68
Average family size	× 3.32
Total in-migrants plus families	226
Number of in-migrants without families (0%)	+ 0
Total indirect growth	<u>226</u>
Total growth	
Total direct growth	3405
Total indirect growth	+ 226
Total projected refurbishment-related growth	<u>3631</u>

Sources: Direct workers from SEA 1994. Average family size from 1990 U.S. Census of Population. Other data from NUREG/CR-2749, vol. 5, pp. 55-85; ORNL staff computations.

Table C.38 Projected plant-related population growth in San Luis Obispo County, California, during the license renewal term

Direct growth

Number of direct workers	120
Number of study area residents (89.2% of total)	107
Number of in-migrants (70% of residents)	75
Number of in-migrants with families (66%)	50
Average family size	× 3.32
Total in-migrants plus families	166
Number of in-migrants without families (33%)	+ 25
Total direct growth	191

Indirect growth

Ratio indirect/direct jobs	0.64
Number of indirect workers	77
Number of study area residents (90% of total)	69
Number of in-migrants (5.0% of residents)	3
Number of in-migrants with families (66%)	2
Average family size	× 3.32
Total in-migrants plus families	7
Number of in-migrants without families (33%)	+ 1
Total indirect growth	8

Total growth

Total direct growth	191
Total indirect growth	+ 8
Total projected refurbishment-related growth	199

Sources: Number of direct workers from NRC work force estimates (1989). Percentage of study area residents from PG&E 1990. Average family size from 1990 U.S. Census of Population. Other data from NUREG/CR-2749, vol. 5; ORNL staff computations.

Table C.39 County basic tax rates, property tax levies, and total county revenues for San Luis Obispo County, 1968–1989

Fiscal year	County basic tax rate (%)	Est. county basic property tax levy (\$ × 10 ³)	Total county general revenues (\$ × 10 ³)	Property tax as % of total
1967–68	2.69	6,721.9	18,190.9	37.0
1969–70	2.96	7,683.7	22,066.1	34.8
1971–72	3.33	10,511.7	26,010.8	40.4
1973–74	3.16	11,408.7	30,168.5	37.8
1975–76	2.86	14,218.7	35,968.5	39.5
1977–78	2.55	17,697.7	51,152.1	34.6
1988–89	1.07	44,156.6	122,730.2	36.0

Source: County of San Luis Obispo 1989.

Table C.40 Distribution of property tax payments from Diablo Canyon, 1975, 1978, and 1988 (in dollars)

	1974–75	1977–78	1988–89
San Luis Obispo County	2,357,254	4,309,248	13,081,327
Port San Luis Harbor District	103,531	211,166	580,329
City of Pismo Beach	11,323	3,206	30,592
Special districts		3,479	524,021
County schools department	309,731	591,780	1,643,189
Atascadero Unified School District	33,348	70,615	454,024
Lucia Mar Unified School District	69,225	80,915	470,700
Paso Robles	20,584	37,884	312,187
San Luis Coastal Unified School District	2,532,841	5,866,220	14,092,286
Shandon Unified School District	690	1,001	86,735
Templeton Unified School District	4,902	7,800	87,080
Community College District	<u>870,197</u>	<u>1,229,082</u>	<u>2,769,846</u>
Total property taxes	6,313,626	12,412,396	34,132,316

Source: NUREG/CR-2749, vol. 5; Stillwell 1990.

Table C.41 San Luis Coastal Unified School District tax rate and tax income, 1969-1989

Fiscal year	Tax rate (%)	Local property tax income (\$ × 10 ³)	Total school district income (\$ × 10 ³)	Property tax as % of total income
1969-70	4.47	5,409.9	7,124.1	75.9
1972-73	4.68	7,500.3	9,560.8	78.4
1975-76	4.03	10,655.3	13,583.0	78.4
1977-78	3.95	15,456.7	18,836.5	82.1
1987-88	NA ^a	26,639.4	32,446.3	82.1
1988-89	NA	29,026.0	36,233.5	80.1

^aNA = not applicable.

Sources For 1969 through 1978 figures, NUREG/CR-2749, vol. 5. For 1987-89 values, Stillwell 1990

Table C.42 Estimated economic effects of Diablo Canyon on San Luis Obispo County

	1975	1978	1990
Employment			
Direct basic employment	1,799	1,121	1,160
Indirect employment	<u>1,354</u>	<u>920</u>	<u>749</u>
Total employment	3,153	2,041	1,909
Percentage of study area employment	6.5	3.5	1.8
Income (1989 \$)			
Direct income	120,094,200	80,425,800	49,839,400
Indirect income	<u>19,821,900</u>	<u>13,462,200</u>	<u>13,418,000</u>
Total income	139,916,100	93,888,000	63,257,000
Percentage of study area income	9.1	4.7	1.7

Sources: For 1975 and 1978 estimates, NUREG/CR-2749, vol. 5. The 1990 estimate is based on the approach used in the Mountain West study.

Table C.43 Projected employment effects of Diablo Canyon refurbishment on San Luis Obispo County, 2023

Refurbishment direct employment	1932
Refurbishment indirect employment	<u>1310</u>
Total Diablo Canyon-related employment	3242
Percentage of San Luis Obispo County employment	1.8

Source: ORNL staff computations based on the approach used in NUREG/CR-2749, vol. 5.

Table C.44 Projected employment effects of Diablo Canyon license renewal on San Luis Obispo County, 2023

Existing direct and indirect employment	1909
Increase in direct employment	107
Increase in indirect employment	<u>69</u>
Total plant-related employment	2085
Percentage of San Luis Obispo County employment	1.2

Source: ORNL staff computations based on the approach used in NUREG/CR-2749, vol 5.

Table C.45 Population growth associated with Indian Point Units 2 and 3: Dutchess and Westchester counties, 1972-1990

Year	Work force			Dutchess County			Westchester County		
	Construction	Operations	Total	Project-related in-migrant population ^a	County's total population ^b	Project-related population as % of total	Project-related in-migrant population ^a	County's total population ^b	Project-related population as % of total
1972	2,400	0	2,400	390	226,673	0.17	309	888,691	0.03
1975	0	500	500	158	233,403	0.07	123	880,187	0.01
1980	0	825	825	259	245,055	0.10	189	866,599	0.02
1985	0	1,110	1,110	344	252,182	0.14	262	870,810	0.03
1990	0	1,335	1,335	415	259,462	0.16	316	874,866	0.04

^aIncludes both direct and indirect workers and families.

^bPopulation assumed to grow at constant annual rate between known points.

Sources: U.S. Bureau of the Census 1988; Krausharr 1990; ConEd 1990; PASNY 1990; ORNL staff computations.

Table C.46 Estimated construction-related population growth in Dutchess County, New York, 1972

Direct growth	
Number of direct workers	2400
Number of direct workers in Dutchess County (17.3% of total)	415
Number who in-migrated (35% of residents)	145
Number of in-migrants with families (51%)	74
Average household size	× 3.25
Total in-migrants plus families	241
Number of in-migrants without families (49%)	+ 71
Total direct growth	<u>312</u>
Indirect growth	
Ratio indirect/direct jobs	0.65
Number of indirect workers	1560
Number of study area residents (40% of total)	624
Number of in-migrants (5% of residents)	31
Number of in-migrants with families (66%)	21
Average household size	× 3.25
Total in-migrants plus families	68
Number of in-migrants without families (33%)	+ 10
Total indirect growth	<u>78</u>
Total growth	
Total direct growth	312
Total indirect growth	+ 78
Total estimated construction-related growth	<u>390</u>

Sources Number of direct workers from AEC Docket 50-247, p. IV-4. Percentage of study area residents from ConEd 1990 and PASNY 1990. Average household size from NUREG/CR-2750. Other data from construction experience at other nuclear stations; ORNL staff computations.

Table C.47 Estimated construction-related population growth in Westchester County, New York, 1972

Direct growth	
Number of direct workers	2400
Number of workers in Westchester County (12.7% of total)	305
Number who in-migrated (35% of residents)	<u>107</u>
Number of in-migrants with families (51%)	55
Average family size	<u>× 3.25</u>
Total in-migrants plus families	179
Number of in-migrants without families (49%)	<u>+ 52</u>
Total direct growth	<u><u>231</u></u>
Indirect growth	
Ratio indirect/direct jobs	0.65
Number of indirect workers	1560
Number of study area residents (40% of total)	624
Number of in-migrants (5% of residents)	<u>31</u>
Number of in-migrants with families (66%)	21
Average family size	<u>× 3.25</u>
Total in-migrants plus families	68
Number of in-migrants without families (33%)	<u>+ 10</u>
Total indirect growth	<u><u>78</u></u>
Total growth	
Total direct growth	231
Total indirect growth	<u>+ 78</u>
Total estimated construction-related growth	<u><u>309</u></u>

Sources Number of direct workers from AEC Docket 50-247, p. IV-4. Percentage of study area residents from ConEd 1990 and PASNY 1990. Average family size from NUREG/CR-2750. Other data from construction experience at other nuclear stations; ORNL staff computations.

Table C.48 Estimated plant-related population growth in Dutchess County, New York, 1990

Direct growth	
Number of direct workers	1335
Number of direct workers in Dutchess County (37.8% of total)	505
Number of in-migrants (30% of residents)	152
Number of in-migrants with families (66%)	100
Average family size	× 3.22
Total in-migrants plus families	322
Number of in-migrants without families (33%)	+ 52
Total direct growth	374
Indirect growth	
Ratio indirect/direct jobs	0.65
Number of indirect workers	868
Number of study area residents (40% of total)	347
Number of in-migrants (5% of residents)	17
Number of in-migrants with families (66%)	11
Average family size	× 3.22
Total in-migrants plus families	35
Number of in-migrants without families (33%)	+ 6
Total indirect growth	41
Total growth	
Total direct growth	374
Total indirect growth	+ 41
Total estimated plant-related growth	415

Sources: Number of direct workers and percentage of study area residents from ConEd 1990 and PASNY 1990. Average family size from 1990 U.S. Census of Population. Other data from operating experience at other nuclear stations; ORNL staff computations.

Table C.49 Estimated plant-related population growth in Westchester County, New York, 1990

Direct growth	
Number of direct workers	1335
Number of direct workers in Westchester County (27.8% of total)	371
Number of in-migrants (30% of residents)	111
Number of in-migrants with families (66%)	74
Average family size	× 3.22
Total in-migrants plus families	238
Number of in-migrants without families (33%)	+ 37
Total direct growth	<u>275</u>
Indirect growth	
Ratio indirect/direct jobs	0.65
Number of indirect workers	868
Number of study area residents (40% of total)	347
Number of in-migrants (5% of residents)	17
Number of in-migrants with families (66%)	11
Average family size	× 3.22
Total in-migrants plus families	35
Number of in-migrants without families (33%)	+ 6
Total indirect growth	<u>41</u>
Total growth	
Total direct growth	275
Total indirect growth	+ 41
Total estimated plant-related growth	<u>316</u>

Sources: Number of direct workers and percentage of study area residents from ConEd 1990 and PASNY 1990. Average family size from 1990 U.S. Census of Population. Other data from operating experience at other nuclear stations; ORNL staff computations.

Table C.50 Projected refurbishment-related population growth in Dutchess County, New York, 2012

Direct growth	
Number of direct workers	2273
Number of workers projected to live in Dutchess County (17.3% of total)	393
Number of in-migrants (35% of residents)	138
Number of in-migrants with families (51%)	70
Average family size	× 3.22
Total in-migrants plus families	225
Number of in-migrants without families (49%)	+ 68
Total direct growth	<u>293</u>
Indirect growth	
Ratio indirect/direct jobs	0.65
Number of indirect workers	1477
Number of study area residents (40% of total)	591
Number of in-migrants (5.0% of residents)	30
Number of in-migrants with families (66%)	20
Average family size	3.22
Total in-migrants plus families	64
Number of in-migrants without families (33%)	+ 10
Total indirect growth	<u>74</u>
Total growth	
Total direct growth	293
Total indirect growth	+ 74
Total projected refurbishment-related growth	<u>367</u>

Sources: Number of direct workers from SEA 1994. Average family size from 1990 U.S. Census of Population. Percentage of study area residents from ConEd 1990 and PASNY 1990. Other data from estimates concerning the construction of Indian Point and other nuclear stations; ORNL staff computations.

Table C.51 Projected refurbishment-related population growth in Westchester County, New York, 2012

Direct growth	
Number of direct workers	2273
Number of workers projected to live in Westchester County (12.7% of total)	289
Number of in-migrants (35% of residents)	101
Number of in-migrants with families (51%)	52
Average family size	× 3.22
Total in-migrants plus families	167
Number of in-migrants without families (49%)	+49
Total direct growth	216
Indirect growth	
Ratio indirect/direct jobs	0.65
Number of indirect workers	1477
Number of study area residents (40% of total)	591
Number of in-migrants (5.0% of residents)	30
Number of in-migrants with families (66%)	20
Average family size	3.22
Total in-migrants plus families	64
Number of in-migrants without families (33%)	10
Total indirect growth	74
Total growth	
Total direct growth	216
Total indirect growth	+74
Total projected refurbishment-related growth	290

Sources: Number of direct workers from SEA 1994. Average family size from 1990 U.S. Census of Population. Percentage of study area residents from ConEd 1990 and PASNY 1990. Other data from estimates concerning the construction of Indian Point and other nuclear stations; ORNL staff computations.

Table C.52 Projected plant-related population growth in Dutchess County, New York, during the license renewal term

Direct growth	
Number of direct workers	120
Number of workers projected to live in Dutchess County (37.8% of total)	45
Number of in-migrants (30% of residents)	13
Number of in-migrants with families (66%)	9
Average family size	× 3.22
Total in-migrants plus families	29
Number of in-migrants without families (33%)	+ 4
Total direct growth	<u>33</u>
Indirect growth	
Ratio indirect/direct jobs	0.65
Number of indirect workers	78
Number of study area residents (40% of total)	31
Number of in-migrants (5% of residents)	2
Number of in-migrants with families (66%)	2
Average family size	× 3.22
Total in-migrants plus families	6
Number of in-migrants without families (33%)	+ 0
Total indirect growth	<u>6</u>
Total growth	
Total direct growth	33
Total indirect growth	+ 6
Total projected plant-related growth	<u>39</u>

Sources Number of direct workers from NRC work force estimates (1989). Average family size from 1990 U.S. Census of Population Percentage of study area residents from ConEd 1990 and PASNY 1990. Other data from operations at Indian Point and other nuclear stations; ORNL staff computations

Table C.53 Projected plant-related population growth in Westchester County, New York, during the license renewal term

Direct growth	
Number of direct workers	120
Number of workers projected to live in Westchester County (27.8% of total)	33
Number of in-migrants (30% of residents)	<u>10</u>
Number of in-migrants with families (66%)	7
Average family size	<u>× 3.22</u>
Total in-migrants plus families	23
Number of in-migrants without families (33%)	<u>+ 3</u>
Total direct growth	<u><u>26</u></u>
Indirect growth	
Ratio indirect/direct jobs	0.65
Number of indirect workers	78
Number of study area residents (40% of total)	31
Number of in-migrants (5% of residents)	<u>2</u>
Number of in-migrants with families (66%)	2
Average family size	<u>× 3.22</u>
Total in-migrants plus families	6
Number of in-migrants without families (33%)	<u>+ 0</u>
Total indirect growth	<u><u>6</u></u>
Total growth	
Total direct growth	26
Total indirect growth	<u>+ 6</u>
Total projected plant-related growth	<u><u>32</u></u>

Sources Number of direct workers from NRC work force estimates (1989). Average family size from 1990 U.S. Census of Population. Percentage of study area residents from ConEd 1990 and PASNY 1990. Average family size from U.S. Census of Population Estimates (1985). Other data from operations at Indian Point and other nuclear stations; ORNL staff computations.

Table C.54 Indian Point tax payments to local government (1989 dollars)

Jurisdiction	1980	1985	1989
Indian Point Unit 2			
Town of Cortlandt	4,653,344	4,783,440	5,743,766 ^a
Buchanan	1,311,318	1,211,437	1,396,344
Hendrick Hudson School District	<u>7,934,365</u>	<u>7,188,180</u>	<u>9,086,374</u>
Total	13,899,027	13,183,057	16,226,484
Indian Point Unit 3			
Town of Cortlandt	1,698,601	408,255	81,464
Buchanan	915,226	635,389	558,480
Hendrick Hudson School District	<u>3,349,628</u>	<u>1,889,939</u>	<u>841,712</u>
Total	5,963,455	2,933,583	1,481,656
Total both units	19,862,482	19,993,105	17,708,140

^aIndian Point Unit 2 tax to town of Cortlandt is for 1990.

Sources: Partenheimer 1990; ORNL/NUMARC survey of all utilities (see Section C.6).

Table C.55 Assessed value of Indian Point Units 2 and 3 as a percentage of total assessed value, 1989-1990

Jurisdiction	Assessed value (dollars)			Assessed value of Units 2 and 3 as % of jurisdiction's total
	Indian Point Unit 2	Indian Point Unit 3	All properties in jurisdiction	
Cortlandt	40,112,900	9,922,590	79,740,587	62.7
Hudson School District	40,112,900	3,715,840	80,867,329	54.2
Buchanan	37,200,880	12,826,470	54,451,569	91.8

Sources: Town of Cortlandt 1990a, b; Hudson School District 1990; Jankowski 1990; Burchman 1990; Partenheimer 1990.

Table C.56 Revenue provided by Indian Point to taxing jurisdictions, 1989–1990

Taxing jurisdiction	Total revenues (\$ × 10 ³)	Revenue from Indian Point (\$ × 10 ³)	Revenue from Indian Point as % of total
Cortlandt	17,740.7	5,906.7	33.3
Hudson School District	26,600.0	9,928.1	37.2
Buchanan	3,940.5	1,954.8	49.6

Sources: Town of Cortlandt 1990a; Partenheimer 1990; Burchman 1990; Jankowski 1990.

Table C.57 Estimated economic effects of Indian Point on Dutchess and Westchester counties, 1990

	Dutchess County	Westchester County
Employment		
Direct basic	505	371
Indirect	<u>500</u>	<u>368</u>
Total	1,005	739
Percentage of study area employment	0.83 (est.)	0.14
Income (1989 \$)		
Direct	18,791,100	13,805,900
Indirect	<u>11,307,900</u>	<u>8,322,700</u>
Total	30,099,000	22,128,700
Percentage of study area income	0.38 (est.)	0.08

Source: ORNL staff computations based on the approach used in NUREG/CR-2750.

Table C.58 Projected employment effects of Indian Point refurbishment on Dutchess and Westchester counties, 2012

Affected area	Dutchess County	Westchester County
Refurbishment direct employment	393	289
Refurbishment indirect employment	<u>591</u>	<u>591</u>
Total Indian Point-related employment	984	880
Percentage of county's employment	0.5	0.2

Source: ORNL staff computations based on the approach used in NUREG/CR-2750.

Table C.59 Projected employment effects of Indian Point license renewal on Dutchess and Westchester counties, 2015

Affected area	Dutchess County	Westchester County
Existing direct and indirect plant-related employment	1005	739
Increase in direct employment	45	33
Increase in indirect employment	<u>45</u>	<u>33</u>
Total plant-related employment	1095	805
Percentage of study area employment	0.60	0.13

Source: ORNL staff computations based on the approach used in NUREG/CR-2750.

**Table C.60 Population growth associated with the Oconee Nuclear Station:
Oconee County, South Carolina, 1970-1990**

Year	Work force			Project-related in-migrant population ^a	County's total population ^b	Project-related population as % of total
	Construction	Operations	Total			
1970	2,108	NA ^c	2,108	631	40,728	1.5
1971	2,342	NA	2,342	701	41,800	1.7
1975	0	462	462	277	43,700	0.6
1979	0	833	833	416	46,000	0.9
1985	300	900	1,200	232	51,973	0.4
1990	899	1,401	2,300	504	57,494	0.9

^aIncludes both direct and indirect workers and families.

^bPopulation assumed to grow at a constant annual rate between known points.

^cNA = not applicable.

Sources: NUREG/CR-2749, vol. 7, p. 89; 1990 U.S. Census of Population; Duke Power Company 1990; ORNL staff computations.

Table C.61 Estimated plant-related population growth in Oconee County, South Carolina, 1990

Direct growth	
Number of direct workers	2300
Number of study area residents (50% of total)	1150
Number of in-migrants (16.4% of residents)	189
Number of in-migrants with families (77%)	146
Average family size	× 3.16
Total in-migrants plus families	461
Number of in-migrants without families (23%)	+ 43
Total direct growth	<u>504</u>
Indirect growth	
Ratio indirect/direct jobs	0.41
Number of indirect workers	943
Number of study area residents (100% of total)	943
Number of in-migrants (0% of residents)	0
Number of in-migrants with families	0
Average family size	× 3.16
Total in-migrants plus families	0
Number of in-migrants without families	+ 0
Total indirect growth	<u>0</u>
Total growth	
Total direct growth	504
Total indirect growth	+ 0
Total estimated plant-related growth	<u>504</u>

Sources: Number of direct workers and percentage of study area residents from the Duke Power Company 1990. Average family size from 1990 U.S. Census of Population. Other data from NUREG/CR-2749, vol. 7. pp. 65-87; ORNL staff computations.

Table C.62 Projected refurbishment-related population growth in Oconee County, South Carolina, 2012

Direct growth	
Number of direct workers	2273
Number of study area residents (25.4% of total)	577
Number of in-migrants (50% of residents)	289
Number of in-migrants with families (33.3%)	96
Average family size	× 3.16
Total in-migrants plus families	303
Number of in-migrants without families (66.6%)	+ 193
Total direct growth	496
Indirect growth	
Ratio indirect/direct jobs	0.052
Number of indirect workers	118
Number of study area residents (100% of total)	118
Number of in-migrants (0% of residents)	0
Number of in-migrants with families	0
Average family size	× 3.16
Total in-migrants plus families	0
Number of in-migrants without families	+ 0
Total indirect growth	0
Total growth	
Total direct growth	496
Total indirect growth	+ 0
Total projected refurbishment-related growth	496

Sources: Direct workers from SEA 1994. Average family size from 1990 U.S. Census of Population. Other data from NUREG/CR-2749, vol. 7, pp. 62-87; ORNL staff computations.

Table C.63 Projected plant-related population growth in Oconee County, South Carolina, during the license renewal term

Direct growth	
Number of direct workers	180
Number of study area residents (50% of total)	90
Number of in-migrants (16.4% of residents)	15
Number of in-migrants with families (77%)	12
Average family size	× 3.16
Total in-migrants plus families	38
Number of in-migrants without families (0%)	+ 3
Total direct growth	<u>41</u>
Indirect growth	
Ratio indirect/direct jobs	0.41
Number of indirect workers	74
Number of study area residents (100% of total)	74
Number of in-migrants (0% of residents)	0
Number of in-migrants with families (0%)	0
Average family size	× 3.16
Total in-migrants plus families	0
Number of in-migrants without families (0%)	+ 0
Total indirect growth	<u>0</u>
Total growth	
Total direct growth	41
Total indirect growth	+ 0
Total projected plant-related growth	<u>41</u>

Sources Direct workers from NRC work force estimates (1989). Average family size from 1990 U.S. Census of Population. Other data from NUREG/CR-2749, vol. 7, pp. 62-87; ORNL staff computations

Table C.64 Oconee County property taxes (1989 dollars)

Source of revenue	1975-76	1980-81	1985-86	1989-90
County assessment	111,034,000	91,198,000	122,277,000	172,718,000
Total county property taxes	15,166,000	12,058,000	14,150,000	22,675,000
Licensee taxes	7,592,000	4,791,000	5,098,000	6,588,000
Total county revenue	30,489,000	29,915,000	35,442,000	46,329,000
Percentage of total tax revenues from licensee	50.1	39.7	36.0	29.1
Percentage of total revenues from licensee	24.9	16.0	14.4	14.2

Sources: NUREG/CR-2749, vol. 7; Oconee County 1980, 1985, and 1989, Budget Ordinances: 80-7, 85-5, and 89-3; Oconee County Independent Auditor's Report; Bridges 1990.

Table C.65 Estimated economic effects of Oconee Nuclear Station on Oconee County

Affected area	1971	1990
Employment		
Direct basic	595	1,150
Indirect	<u>111</u>	<u>948</u>
Total	706	2,098
Percentage of county employment	3.3	6.5
Income (1989 \$)		
Direct	15,097,000	46,033,000
Indirect	<u>1,424,000</u>	<u>17,940,000</u>
Total	16,520,000	63,973,000
Percentage of county income	4.4	7.5

Source: For 1971, NUREG/CR-2749, vol. 7. Other estimates based on employment estimates from Section C.4.5.1 and multipliers from NUREG/CR-2749. Estimates of county employment and income used to calculate percentages are from NPA 1990.

Table C.66 Projected employment effects of Oconee Nuclear Station refurbishment on Oconee County, 2012

Refurbishment direct employment	577
Refurbishment indirect employment	<u>118</u>
Total plant-related employment	695
Percentage of Oconee County employment	1.9

Source: ORNL staff computations based on the approach used in NUREG/CR-2749, vol. 7.

Table C.67 Projected employment and economic effects of Oconee Nuclear Station license renewal on Oconee County, 2013

Existing direct and indirect plant-related employment	1150
Increase in direct employment	90
Increase in indirect employment	<u>74</u>
Total plant-related employment	1314
Percentage of Oconee County employment	3.6

Source: ORNL staff computations based on the approach used in NUREG/CR-2749, vol. 7.

Table C.68 Population growth associated with Three Mile Island: Londonderry Township, Middletown, and Royalton, Pennsylvania, 1970-1990

Year	Work force			Project-related in-migrant population ^a	Area's total population ^b	Project-related population as % of total
	Construction	Operations	Total			
1970	1,991	86	2,077	223	13,573	1.6
1972	2,746	126	2,872	310	14,225	2.2
1975	1,453	342	1,795	256	15,316	1.7
1979	0	565	565	110	16,243	0.7
1984	0	1,399	1,399	272	16,790	1.6
1990	0	1,086	1,086	246	14,636	1.7

^aIncludes both direct and indirect workers and families.

^bPopulation assumed to grow at a constant annual rate between known points.

Sources: NUREG/CR-2749, vol. 12, p. 77; General Public Utilities Corporation 1990; ORNL staff computations.

Table C.69 Estimated plant-related population growth in Middletown, Royalton, and Londonderry Township, Pennsylvania, 1990

Direct growth	
Number of direct workers	1086
Number of study area residents (23% of total)	250
Number of in-migrants (22% of residents)	55
Number of in-migrants with families (100%)	55
Average family size	× 3.1
Total in-migrants plus families	171
Number of in-migrants without families (0%)	+ 0
Total direct growth	171
Indirect growth	
Ratio indirect/direct jobs	0.106
Number of indirect workers	115
Number of study area residents (85% of total)	98
Number of in-migrants (33.3% of residents)	33
Number of in-migrants with families (61%)	20
Average family size	× 3.1
Total in-migrants plus families	62
Number of in-migrants without families (39%)	+ 13
Total indirect growth	75
Total growth	
Total direct growth	171
Total indirect growth	+ 75
Total estimated plant-related growth	246

Sources: Number of direct workers and percentage of study area residents from General Public Utilities Corporation 1990. Average family size from 1990 U.S. Census of Population. Other data from NUREG/CR-2749, vol. 12, pp. 66-78; ORNL staff computations.

Table C.70 Projected refurbishment-related population growth in Middletown, Royalton, and Londonderry Township, Pennsylvania, 2013

Direct growth	
Number of direct workers	2273
Number of study area residents (8.0% of total)	182
Number of in-migrants (72% of residents)	<u>131</u>
Number of in-migrants with families (9.0%)	12
Average family size	<u>× 3.1</u>
Total in-migrants plus families	37
Number of in-migrants without families (91%)	<u>+ 119</u>
Total direct growth	<u><u>156</u></u>
Indirect growth	
Ratio indirect/direct jobs	0.022
Number of indirect workers	50
Number of study area residents (85% of total)	43
Number of in-migrants (33% of residents)	<u>14</u>
Number of in-migrants with families (62%)	9
Average family size	<u>× 3.1</u>
Total in-migrants plus families	28
Number of in-migrants without families (38%)	<u>+ 5</u>
Total indirect growth	<u><u>33</u></u>
Total growth	
Total direct growth	156
Total indirect growth	<u>+ 33</u>
Total projected refurbishment-related growth	<u>189</u>

Sources: Number of direct workers from SEA 1994. Average family size from 1990 U.S. Census of Population. Other data from NUREG/CR-2749, vol. 12, pp. 50-55, 74-76; ORNL staff computations.

Table C.71 Projected plant-related population growth in Middletown, Royalton, and Londonderry Township, Pennsylvania, during the license renewal term

Direct growth	
Number of direct workers	60
Number of study area residents (23% of total)	14
Number of in-migrants (22% of residents)	3
Number of in-migrants with families (100%)	3
Average household size	× 3.1
Total in-migrants plus families	9
Number of in-migrants without families (0%)	+ 0
Total direct growth	9
Indirect growth	
Ratio indirect/direct jobs	0.106
Number of indirect workers	6
Number of study area residents (85% of total)	5
Number of in-migrants (33.3% of residents)	2
Number of in-migrants with families (61%)	1
Average family size	× 3.1
Total in-migrants plus families	3
Number of in-migrants without families (39%)	+ 1
Total indirect growth	4
Total growth	
Total direct growth	9
Total indirect growth	+ 4
Total projected plant-related growth	13

Sources: Number of direct workers from NRC work force estimates (1989). Percentage of study area residents from General Public Utilities Corporation 1990. Average family size from 1990 U.S. Census of Population. Other data from NUREG/CR-2749, vol. 12, pp. 66-78; ORNL staff computations.

Table C.72 Londonderry Township revenue and taxes received (total revenue in constant 1980 dollars)

Source of funds	1980	1985	1989
Real estate transfer taxes	11,189	15,931	17,780
Earned income taxes	181,858	235,599	268,818
Occupational privilege taxes	11,819	14,697	13,255
Amusement tax	<u>0</u>	<u>393</u>	<u>139</u>
Total taxes	204,866	266,620	299,992
Payment in lieu of taxes (PURTA ^a receipts)	1,988	3,390	3,723
Other revenue	<u>70,323</u>	<u>60,697</u>	<u>180,787</u>
Total revenue	277,177	255,178 ^b	330,953 ^c

^aPURTA = Public Utility Realty Tax Assessment of 1970.

^bActual total was \$330,707; converted to 1980 \$.

^cActual total was \$484,502; converted to 1980 \$.

Source: Londonderry Township 1990.

Table C.73 Borough of Middletown revenue and taxes received, 1980-1988 (in dollars)

Source of funds	1980	1985	1988
Taxes and assessments	461,582	619,595	653,728
Other general revenues	1,425,752	410,952	522,498
Special revenues and other financing sources	1,157,301 ^a	542,006	685,378
Electricity/utility sales	1,572,283	3,273,839 ^a	4,027,375 ^a
Total revenues	4,616,918	4,842,392	5,888,979

^aIncludes sewer and water service billings.

Source: Middletown Borough combined Financial Statements 1980, 1985, and 1988.

Table C.74 Borough of Royalton revenue and taxes received, 1980-1989 (in dollars)

Source of funds	1980	1985	1989
Real estate	15,677	15,288	18,332
Per capita taxes	2,350	2,528	2,618
Real estate			
Transfer taxes	884	1,422	3,870
Earned income taxes	<u>24,463</u>	<u>27,630</u>	<u>42,323</u>
Total taxes	43,374	46,868	67,143
Sales of electricity	167,216	196,135	240,293
Other revenue	<u>41,130</u>	<u>49,817</u>	<u>191,807</u>
Total revenue	251,720	292,820	499,243

Source: Royalton Borough 1990; Young 1990.

Table C.75 Traffic counts in the vicinity of Three Mile Island,^a selected years

Year	Route 441 at Royalton	Route 230 at Geyer's Church
1963	5,900	18,500
1966	6,200	18,000
1972	10,900	12,900
1975	8,800	12,800

^aCounts in both directions aggregated.

Source: NUREG/CR-2749, vol. 12, p. 113.

Table C.76 Estimated economic effects of Three Mile Island on study area

Affected area	1972	1978	1990
Employment			
Direct basic	258	178	250
Indirect	<u>1</u>	<u>2</u>	<u>98</u>
Total	259	180	348
Percentage of study area	2.1	1.2	13.0
Income (1989 \$)			
Direct	11,809,000	4,636,000	9,208,000
Indirect	<u>24,000</u>	<u>31,000</u>	<u>1,843,000</u>
Total	11,833,000	4,667,000	11,051,000
Percentage of study area	2.7	2.0	17.0

Sources For 1972 and 1978 estimates, NUREG/CR-2749, vol. 12. The 1990 estimate is based on the approach used in the Mountain West study

Table C.77 Projected employment effects of Three Mile Island refurbishment on the study area, 2013

Refurbishment direct employment	182
Refurbishment indirect employment	<u>43</u>
Total plant-related employment	225
Percentage of study area employment	6.0

Source ORNL staff computations based on the approach used in NUREG/CR-2749, vol. 12.

Table C.78 Projected employment effects of Three Mile Island license renewal on the study area, 2013

Existing direct and indirect employment	348
Increase in direct employment	14
Increase in indirect employment	<u>5</u>
Total plant-related employment	367
Percentage of study area employment	9.8

Source ORNL staff computations based on the approach used in NUREG/CR-2749, vol. 12.

Table C.79 Population growth associated with Wolf Creek Generating Station: Coffey County, Kansas, 1984-1989

Year	Work force			Project-related in-migrant population ^a	Area's population ^b	Project-related population as % of total
	Construction	Operations	Total			
1984	5500	0	5500	2329	9001	20.5
1985	0	692	692	755	8910	8.5
1989	0	1044	1044	1137	8559	13.3

^aIncludes both direct and indirect workers and families.

^bPopulation assumed to change at a constant annual rate between known points; excludes refurbishment population that arrived after 1980 and left before 1990 census takings. Population in 1980 and 1990 was 9370 and 8404, respectively.

Sources: Wolf Creek Nuclear Operating Corporation 1990; other data from construction at other nuclear plants; ORNL staff computations; U.S. Bureau of the Census 1988, 1990.

Table C.80 Estimated construction-related population growth in Coffey County, Kansas, 1984

Direct growth

Number of direct workers	5500
Number of study area residents (20% of total)	1100
Number of in-migrants (70% of residents)	770
Number of in-migrants with families (51%)	393
Average family size	× 3.08
Total in-migrants plus families	1210
Number of in-migrants without families (44%)	+ 377
Total direct growth	1587

Indirect growth

Ratio indirect/direct jobs	0.05
Number of indirect workers	275
Number of study area residents (95% of total)	261
Number of in-migrants (55% of residents)	144
Number of in-migrants with families (66%)	95
Average family size	× 3.08
Total in-migrants plus families	293
Number of in-migrants without families (33%)	+ 49
Total indirect growth	342

Total growth

Total direct growth	1587
Total indirect growth	+ 342
Total estimated construction-related growth	2329

Sources Number of direct workers from the Wolf Creek Nuclear Operating Corporation 1990. Average family size from 1990 U.S. Census of Population. Other data from construction-period experience at other nuclear plants; ORNL staff computations.

Table C.81 Estimated plant-related population growth in Coffey County, Kansas, 1989

Direct growth	
Number of direct workers	1044
Number of study area residents (50% of total)	522
Number of in-migrants (50% of residents)	261
Number of in-migrants with families (66%)	172
Average family size	× 3.08
Total in-migrants plus families	530
Number of in-migrants without families (33%)	+ 89
Total direct growth	<u>619</u>
Indirect growth	
Ratio indirect/direct jobs	0.4
Number of indirect workers	418
Number of study area residents (95% of total)	397
Number of in-migrants (55% of residents)	218
Number of in-migrants with families (66%)	144
Average family size	× 3.08
Total in-migrants plus families	444
Number of in-migrants without families (33%)	+ 74
Total indirect growth	<u>518</u>
Total growth	
Total direct growth	619
Total indirect growth	+ 518
Total estimated plant-related growth	<u>1137</u>

Sources: Number of direct workers and percentage of study area residents from the Wolf Creek Nuclear Operating Corporation 1990. Average family size from 1990 U.S. Census of Population. Other data from operations period experience at other nuclear plants; ORNL staff computations.

Table C.82 Projected refurbishment-related population growth in Coffey County, Kansas, 2024

Direct growth	
Number of direct workers	2273
Number of study area residents (20% of total)	455
Number of in-migrants (70% of residents)	319
Number of in-migrants with families (51%)	163
Average family size	× 3.08
Total in-migrants plus families	502
Number of in-migrants without families (49%)	+ 156
Total direct growth	<u>658</u>
Indirect growth	
Ratio indirect/direct jobs	0.05
Number of indirect workers	114
Number of study area residents (95% of total)	108
Number of in-migrants (55% of residents)	59
Number of in-migrants with families (66%)	39
Average family size	× 3.08
Total in-migrants plus families	120
Number of in-migrants without families (33%)	+ 20
Total indirect growth	<u>140</u>
Total growth	
Total direct growth	658
Total indirect growth	+ 140
Total projected refurbishment-related growth	<u>798</u>

Sources: Number of direct workers from SEA 1994. Average family size from 1990 U.S. Census of Population. Other data from construction period experience at other nuclear plants; ORNL staff computations.

Table C.83 Projected plant-related population growth in Coffey County, Kansas, during the license renewal term

Direct growth	
Number of direct workers	60
Number of study area residents (50% of total)	30
Number of in-migrants (50% of residents)	15
Number of in-migrants with families (66%)	10
Average family size	× 3.08
Total in-migrants plus families	31
Number of in-migrants without families (33%)	+ 5
Total direct growth	<u>36</u>
Indirect growth	
Ratio indirect/direct jobs	0.4
Number of indirect workers	24
Number of study area residents (95% of total)	23
Number of in-migrants (55% of residents)	13
Number of in-migrants with families (66%)	9
Average family size	× 3.08
Total in-migrants plus families	28
Number of in-migrants without families (33%)	+ 4
Total indirect growth	<u>32</u>
Total growth	
Total direct growth	36
Total indirect growth	+ 32
Total projected plant-related growth	<u>68</u>

Sources: Number of direct workers from NRC work force estimates (1989). Percentage of study area residents from the Wolf Creek Nuclear Operating Corporation 1990. Average family size from 1990 U.S. Census of Population. Other data from operations period experience at other nuclear plants; ORNL staff computations.

Table C.84 Increases in rental rates and housing values, Coffey County and state of Kansas, 1970 and 1980 (in dollars)

	Coffey County	State of Kansas
Rental rates		
1970	46	75
1980	156	168
Percentage change	239	124
Housing values		
1970	6,300	12,100
1980	24,300	37,800
Percentage change	286	212

Sources: For 1970, U.S. Bureau of the Census 1972; for 1980, U.S. Bureau of the Census 1982.

Table C.85 Taxes paid by Wolf Creek Generating Station, 1980-1989 (constant 1989 dollars)

Jurisdiction	1980	1985	1989
State of Kansas	268,004	732,610	729,602
Coffey County	3,249,980	9,869,732	14,061,868
Burlington School District	3,557,468	7,117,846	7,102,472

Source: ORNL/NUMARC survey of all utilities (see Section C.6).