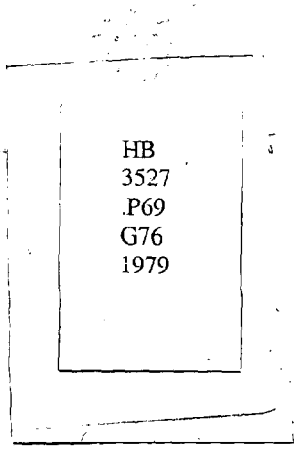

2.1

Mass. Coastal Zone Management Program

GROWTH-RELATED IMPACTS OF THE PILGRIM II NUCLEAR POWER PLANT

PLYMOUTH, MASSACHUSETTS

December 1979

METCALF & EDDY, INC. | ENGINEERS & PLANNERS

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METCALF & EDDY, INC.
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TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF FIGURES

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REPORT

CHAPTER 1

INTRODUCTION

For the past decade, the Town of Plymouth, a coastal community on the South Shore of Massachusetts, has experienced rapid population growth. The surge in population growth coincided with the development of the 655 megawatt Pilgrim I nuclear power plant, which led to considerable speculation that the nuclear plant caused the growth. A second unit of the power plant, Pilgrim II, is proposed as a 1,180 megawatt facility with construction beginning in 1980. There is concern among local officials that additional population growth similar to that attributed to Pilgrim I will occur when Pilgrim II construction begins. The power plant site is located on the Plymouth coast because of the availability of seawater for cooling.

In July of 1979, the Town retained Metcalf & Eddy to identify and evaluate the expected growth-related effects of Pilgrim II. The fundamental purpose of the study was to identify measures which might mitigate the adverse effects of this energy facility. The scope of the study was to:

- review current research and methodologies for socioeconomic impact assessment of Pilgrim I and II and other similar facilities;
- develop a qualitative socioeconomic impact assessment model that simulated the growth processes in Plymouth due to Pilgrim II plant construction and operation;

- describe the Town growth which would occur without Pilgrim II;
- identify and evaluate growth impacts due to Pilgrim II through the use of the model developed; and
- identify measures to mitigate the negative growth-related socioeconomic impacts of Pilgrim II.

The results of this study are an integral part of a comprehensive planning program presently being undertaken by the Town. This program, founded in part on goals for growth management and tax rate control, will be presented to Town meeting in 1980 for implementation. It should provide the Town with the capacity to manage and mitigate the growth impacts of the Pilgrim II plant.

This study was funded through a combination of local funds and a Federal Coastal Energy Impact Program grant administered by the Massachusetts Office of Coastal Zone Management.

CHAPTER 2

LITERATURE REVIEW

Existing knowledge of the growth-related socioeconomic impacts of nuclear power plants is not well advanced since nuclear power plants are relatively new and early studies of impacts usually ignored socioeconomic effects.(1) However, what does exist in the literature on these impacts can be generally categorized as either:

- case studies of existing facilities with descriptions and some quantification of growth impacts;
- forecasting models that estimate impacts of proposed plants based on measurement of growth processes that were hypothesized or observed in other communities with energy plants.

The discussion of the literature is presented in these two categories. An annotated biblography of literature reviewed for this study is presented as an Appendix to this report.

Case Studies

Case studies provide descriptive information concerning growth impacts of individual nuclear power plants. They use research methods such as surveys, interviews, census and other data analysis supplemented by analysis of newspapers, articles, letters and transcripts associated with a project. Case studies are helpful in understanding how much and what types of growth-related impacts are associated with the construction and operation of an energy plant.

Many of the case studies focus on the socioeconomic impacts of siting energy facilities in remote areas, which results in a "boomtown" occurrence. The boomtown usually occurs when the influx of the construction workers, their families, and support personnel relocate to an area, placing severe and rapid demands on the housing market, health and public services, and commercial facilities.(2) In Plymouth, the "boomtown" effect is moderated due to the proximity of an existing available labor force within commuting distance.

Of more relevance to the potential impacts of Pilgrim II was a post-licensing case study of the effects on the community of Pilgrim I in Plymouth and Millstone I and II in Waterford, Connecticut.(3) This study found the following social and economic effects for both communities:

- Construction impacts were minor due to the availability of workers with community distance.
- The primary impact of the nuclear plants in both communities was an increase in the property tax base and short-term decreases in property tax rates.
- Indirect consequences of these tax effects impact were (1) professionalization of local government, (2) increased recognition of growth issues, and (3) increased tensions between the plant's community and surrounding communities which received no tax benefits but shared risks of the plant.(3)

In spite of the similarities of these effects on the two communities, the population effects were markedly different, with Plymouth experiencing significant growth and Waterford remaining relatively stable as shown in Table 1.

TABLE 1. POPULATION CHANGES IN PLYMOUTH AND WATERFORD

	Plymouth	Waterford
Pre-construction population	15,400	16,600
Post-construction population	28,000	18,300
Change	+12,600	+ 1,700

The lack of restrictive land use controls, considerable publicity about the favorable tax advantages provided by nuclear plants, and sizeable growth potential in the region were cited as the factors that stimulated growth in Plymouth as compared to Waterford. This study, and another prepared at Oak Ridge National Laboratories on the fiscal impacts of the two plants,(4) suggested that growth is not induced solely by tax rate reductions, since both towns used additional tax revenues from the plant to lower property tax rates, but by the degree of public attention and exposure drawn to these tax benefits and their related potentials for improved public services. This public attention occurred in the case of Plymouth and not in Waterford.

Forecasting Models

Forecasting models described in the literature on socio-economic impacts of power plants focus on boomtowns and growth

induced by labor force changes. They include input-output models to project regional plant induced employment; econometric forecasting to project areawide employment changes; gravity models to project population allocations to towns near an energy facility; cohort survival models to project total population by age/sex groups, and models that reflect subsequent changes in public facilities needs and tax revenues.(5)

The major limitation of these models is that none of them consider the growth impacts resulting from the plant's tax revenues, which was identified in the Pilgrim I case studies as the most important factor causing growth. In addition, they usually have extensive data and information requirements that are time consuming to obtain; most of the models project regional rather than local impacts; and few have been applied to more than one geographical area.

Although there is no single existing model suited to forecast the growth impacts of Pilgrim II, the literature review of models provides important insight into how to structure growth processes in the model for Pilgrim II. In particular, the economic base theory used in modeling indicates that when a nuclear plant causes an increase in population and plant-related employment, there will also be a measurable increase in local retail and service employment, since new residents and employees spend a portion of their incomes locally on goods and services. In these models, the retail and service sector employment generated by this process of local economic activity is called "multiplier" employment.

Conclusions from the Literature Review

The literature search on socioeconomic impacts of nuclear power plants indicates that tax revenues and, to a lesser extent, the demand for labor force during construction and operation are the significant features of the nuclear plant that cause growth in population and employment. Due to the multiplier effect, employment growth includes both plant-related and retail and service sector jobs.

The literature search suggested that since no actual research has been performed to estimate growth impacts from plants like Pilgrim II, the best approach to determining what will be the growth impacts of the Pilgrim II plant is to examine more closely what happened during Pilgrim I and apply these findings for Pilgrim II.

CHAPTER 3

PLYMOUTH'S PILGRIM I EXPERIENCE

The literature search, particularly the case studies, indicated that a closer examination of the growth impacts induced by tax revenues and labor force of Pilgrim I would be appropriate. This section analyzes the type and magnitude of these impacts. The basis for this analysis included discussions with Boston Edison and local officials and review of historical data on the Pilgrim I plant and fiscal and socioeconomic characteristics of Plymouth.

This analysis addressed five questions:

- What was the magnitude of the labor force and tax revenue generated by Pilgrim I?
- How much of Plymouth's growth during the 1970's was attributable to Pilgrim I?
- Of the growth attributable to Pilgrim I, how much was due to the labor force and how much was due to tax revenues?
- What was the timing and magnitude of tax rate effects in Plymouth?
- How long did the growth impacts of the tax revenues last?

Each of these questions is described below.

Labor Force and Tax Revenue Generated

The construction period for the Pilgrim I plant was September 1968 to December 1972. The average number of

construction workers on the site each year was 500, with a peak force of 750 in 1970. Approximately 70 percent of the construction workers commuted to work at the site.(7) Over the course of the entire construction period, approximately 300 construction workers settled permanently in Plymouth, which was about 15 percent of the total number of workers involved in construction of the plant. Labor force impacts during the operation phase of the plant presently include 150 permanent jobs, with approximately 90 of these employees presently living in Plymouth.(10)

Since 1973, the plant has generated approximately $7 million in property taxes annually. The impact of the Pilgrim I plant on the local property tax structure was significant between 1970 and 1975, when the plant was completed and began operation. Table 2 shows the impact of the plant on assessed values in Plymouth.

Growth Attributable to Pilgrim I

During the early 1960's, Route 3 was completed and the South Shore of Massachusetts as a whole grew rapidly. Between 1965 and 1970, Plymouth experienced significant growth impacts from Route 3 and had a five-year growth rate of 20 percent (up from a 6.7 percent growth rate between 1960 to 1965). Since towns to the north of Plymouth on Route 3 experienced the accelerated growth rates for approximately 10 years (1960-1970) before leveling off to more moderate rates by 1975, Plymouth in the absence of Pilgrim I would have experienced its Route 3 induced

growth in the period 1965 to 1975. This is based on the assumption that growth started later but would last at least 10 years as it had with communities closer to Boston.

TABLE 2. IMPACT OF PILGRIM I ON ASSESSED VALUES

Year	Assessed value of town(1)	Plant assessed value(1)	Plant as a proportion of total assessed value, %
1966	$ 43,451		
1967	45,827		
1968	47,629	$ 132	
1969	51,515	1,456	0.03
1970	68,751	14,510	0.21
1971	93,728	29,808	0.32
1972	114,559	44,808	0.39
1973	154,429	76,442	0.49
1974-75	165,212	76,442	0.46

1. In thousands of dollars.

Sources: Annual Reports: Town of Plymouth 1966-1975. Additional unpublished data provided by the Town Assessor's Office.

The approach to estimating how much of Plymouth's growth after 1970 was attributable to Pilgrim I requires the assumption that Route 3 would have caused the 1970 to 1975 growth rates to be comparable but not in excess of the previous five-year rate. Therefore, Pilgrim I would have been responsible for the excess growth.

In 1970, Plymouth's population was 18,600. Between 1970 and 1975, had Plymouth continued to grow at its previous (accelerated) five-year rate of 20 percent, its population in 1975 would have been 22,300, an increase of 3,700 persons. Instead, Plymouth's population was 26,900, which represented a five-year growth rate of 45 percent for the Town and an increase of 1,660 per year. It would appear, therefore, that growth of approximately 4,600 persons was attributable to Pilgrim I for the years 1970 to 1975.

Between 1975 and 1979 growth in the region as a whole slowed down substantially from the previous period (1970 to 1975). This was in part due to the 1974 recession, which had a devastating impact on the real estate industry. Plymouth's growth, like that of the region, was also moderated during the period to an annual increase of 1,150 persons per year. Nevertheless, Plymouth continued to capture an overwhelming share of the region's growth during this period and to reflect a comparatively high level of growth activity.

Building permit data for the Old Colony Planning Council region (excluding Brockton) shows that Plymouth issued approximately 45 percent of the regional total of building permits between 1976 and 1978. It would appear, therefore, that the Pilgrim I growth impact has continued through this period. It is estimated that, as in the period from 1970 to 1975, approximately one-half of the growth in the Town is attributable to Pilgrim I.

Plymouth's population growth from 1970 to 1979 is summarized below:

	1970-1975	1975-1979*	1970-1979
Total population growth	8,300	4,650	12,950
Growth due to Pilgrim I	4,600	2,300	6,900

Growth Attributable to Labor Force Versus Tax Revenues

It is estimated that approximately 390 Pilgrim I employees, consisting of 300 construction and 90 operation personnel moved to Plymouth between 1970 and 1975.(7) Assuming these employee households had an average of 3.0 persons per household, this resulted in a permanent population increase of approximately 1,200 persons.

The growth due to tax revenues between 1970 and 1975 was therefore 3,400, the remainder of the total increase of 4,600. Since it has been estimated that Plymouth's population would have increased by 3,700 (20 percent) to 1975 if Pilgrim I had not been built, the growth due to tax revenues caused almost a doubling in the baseline growth rate. This effect continued through 1979.

Timing and Magnitude of Tax Rate Reductions

The period from 1970 to 1975 was when Pilgrim I had its most dramatic fiscal effects on Plymouth. Table 3 shows the plant proportion of the total assessed value of the Town and the changes in equalized tax rates. From these figures, it appears that there could be a direct relationship between population

*Estimated.

growth and tax rate reductions. Surprisingly, however, as shown in Table 4, nearby communities in the Old Colony Planning Council (OCPC) region also experienced reduction in equalized tax rates during those years due to increased availability of Federal and State revenues. However, in terms of percentage decreases, Plymouth's decrease was the second greatest. This lends credence to the hypothesis from the literature search that growth is not induced solely by tax rate reductions, but by public attention drawn to the plant's significant tax revenues and the potentials they seem to offer for low taxes and better public services. In Plymouth, there was considerable publicity concerning the tax benefits to the Town of the Pilgrim I plant.

TABLE 3. PLANT PROPORTION OF TOTAL ASSESSED VALUE AND EQUALIZED TAX RATE IN PLYMOUTH

Year	Plant as a proportion of total assessed value	Equalized tax rate $/1,000
1969	.03	34.02
1970	.21	39.90
1971	.32	35.80
1972	.39	49.90
1973	.49	53.50(1)
1974-75	.46	26.60
1976	.46	28.80
1977	.44	37.08

1. Tax rates rose because a major capital project was funded with property tax revenues.

Source: Municipal Financial Data, Massachusetts Taxpayers Foundation, 1969-1976.

TABLE 4. EQUALIZED TAX RATE REDUCTIONS OF COMMUNITIES IN OCPC REGION

	1970 ($)	1976[1] ($)	Rate change 70-76	% of 1970
Abington	48.00	43.10	-4.9	-10.2
Avon	45.00	42.80	-2.2	-4.9
Bridgewater	51.90	42.30	-9.6	-18.5
E. Bridgewater	48.00	42.40	-5.6	-11.7
Easton	42.00	37.40	-4.6	-11.0
Hanson	42.00	35.70	-6.3	-15.0
Kingston	50.60	34.50	-16.1	-31.8
Pembroke	46.02	38.70	-7.32	-15.9
PLYMOUTH	39.78	28.40	-11.38	-28.6
Stoughton	56.71	41.50	-15.21	-26.8
W. Bridgewater	54.61	42.70	-11.91	-21.8
Whitman	43.40	42.30	-0.10	0

1. 1976 given for comparison because 1974-1975 was the 18-month period in which the municipalities in the Commonwealth changed to a July-to- June fiscal year.

Source: Municipal Financial Data, 1970, 1976, Massachusetts Taxpayers Foundation.

Duration of Tax Revenue Effects

Between 1975 and the present, Plymouth has continued to attract substantial population growth due to Pilgrim I, which implies that the tax revenue effects last at least 10 years.

CHAPTER 4

SOCIOECONOMIC IMPACT ASSESSMENT MODEL FOR PILGRIM II

The socioeconomic impact assessment model for Pilgrim II is a tool for determining the growth implications of constructing and operating a second nuclear power plant in Plymouth. The model provides a conceptual framework for the theory that labor force and tax revenues are the plant characteristics that will affect the Town's growth rate during the plant's construction phase and first few years of operation. This theory is based on the findings of the literature search, Plymouth's experience with Pilgrim I, information about the characteristics of the Pilgrim II plant and present community characteristics.

Figure 1 shows the conceptual model. Labor force and tax revenues cause changes in population, employment, housing and school enrollments. These four growth parameters were selected because they:

- are basic parameters that affect provision of public facilities in the Town;
- can be readily monitored; and
- are the same parameters that are being used in the Town's comprehensive planning process.

The relationship between the plant characteristics, specifically labor force and tax revenues, and changes in the growth parameters for the Town, as represented in the model, are described below.

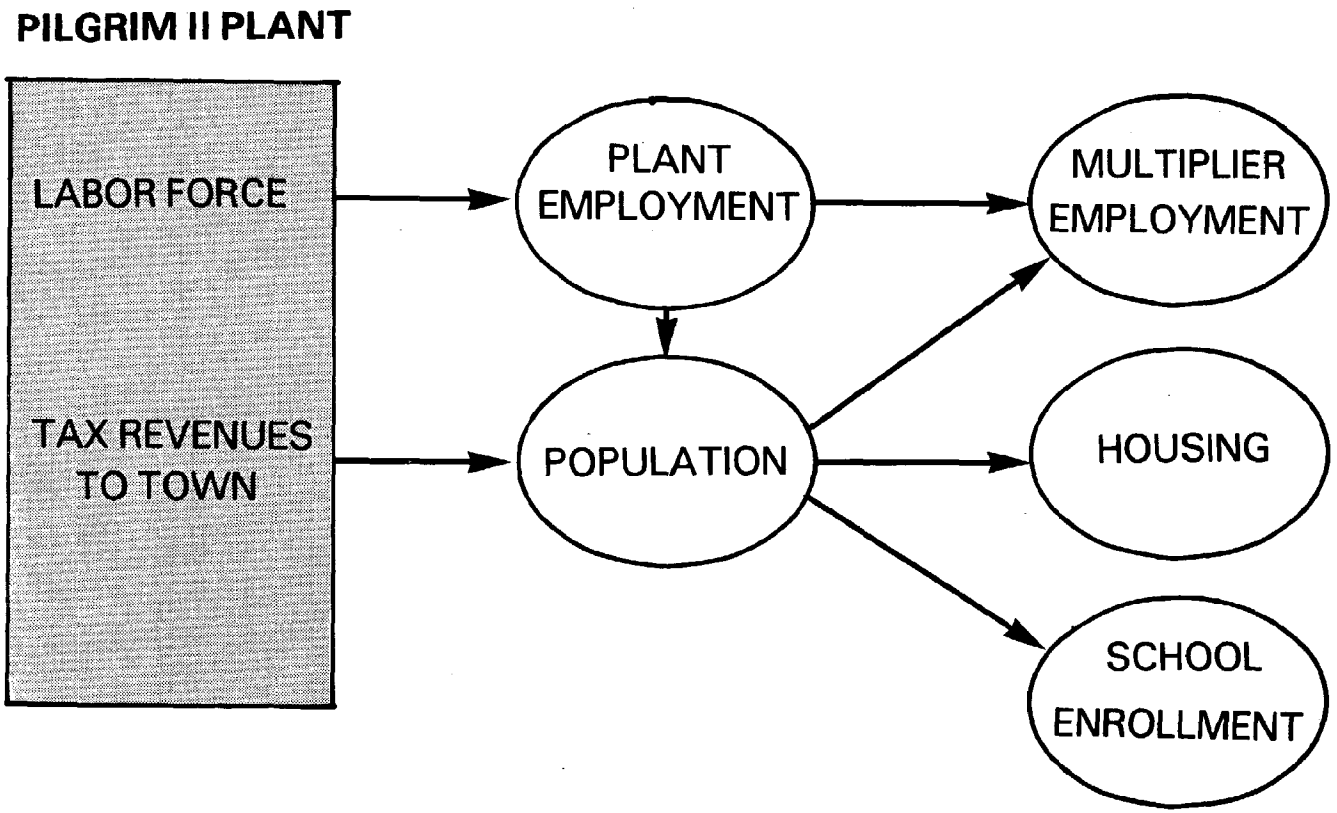


FIGURE 1. IMPACT ASSESSMENT MODEL

Labor Force Component

The construction and operation of Pilgrim II will generate many temporary construction jobs and some permanent jobs, and will result in some in-migration of construction workers and operation personnel. These new residents will place demands on housing and schools. Local expenditure of wages by construction workers and operation personnel living and/or just working in Plymouth will generate retail and service sector activity which will increase the number of "multiplier" jobs.(8)

Tax Revenues Component

The plant represents an improvement to property of hundreds of millions of dollars, which means that its assessed value will significantly increase Plymouth's property tax base. To the degree that there is publicity about the possibilities these revenues will be used to improve and expand services or lower taxes, Plymouth would be likely to attract new residents. These new residents would require housing, add school children to the system and generate "multiplier" employment due to expenditure of wages on locally provided housing, goods and services.

Factors that influence the magnitude of labor force impacts include the number of workers who choose to locate in Plymouth, worker income levels, and the proportion of that income each worker spends locally. Factors that influence the magnitude of the tax revenue impacts include the amount of land locally available for development, land use controls that restrict development, housing, land and transportation costs and the

Town's image as a "family" community, including considerations of good schools, recreation facilities and other amenities. These factors influencing the magnitude of the plant's growth impacts will be discussed further when the model is applied in detail and used to estimate a range of growth impacts. They represent the factors that typically restrain or enhance local growth processes.

CHAPTER 5

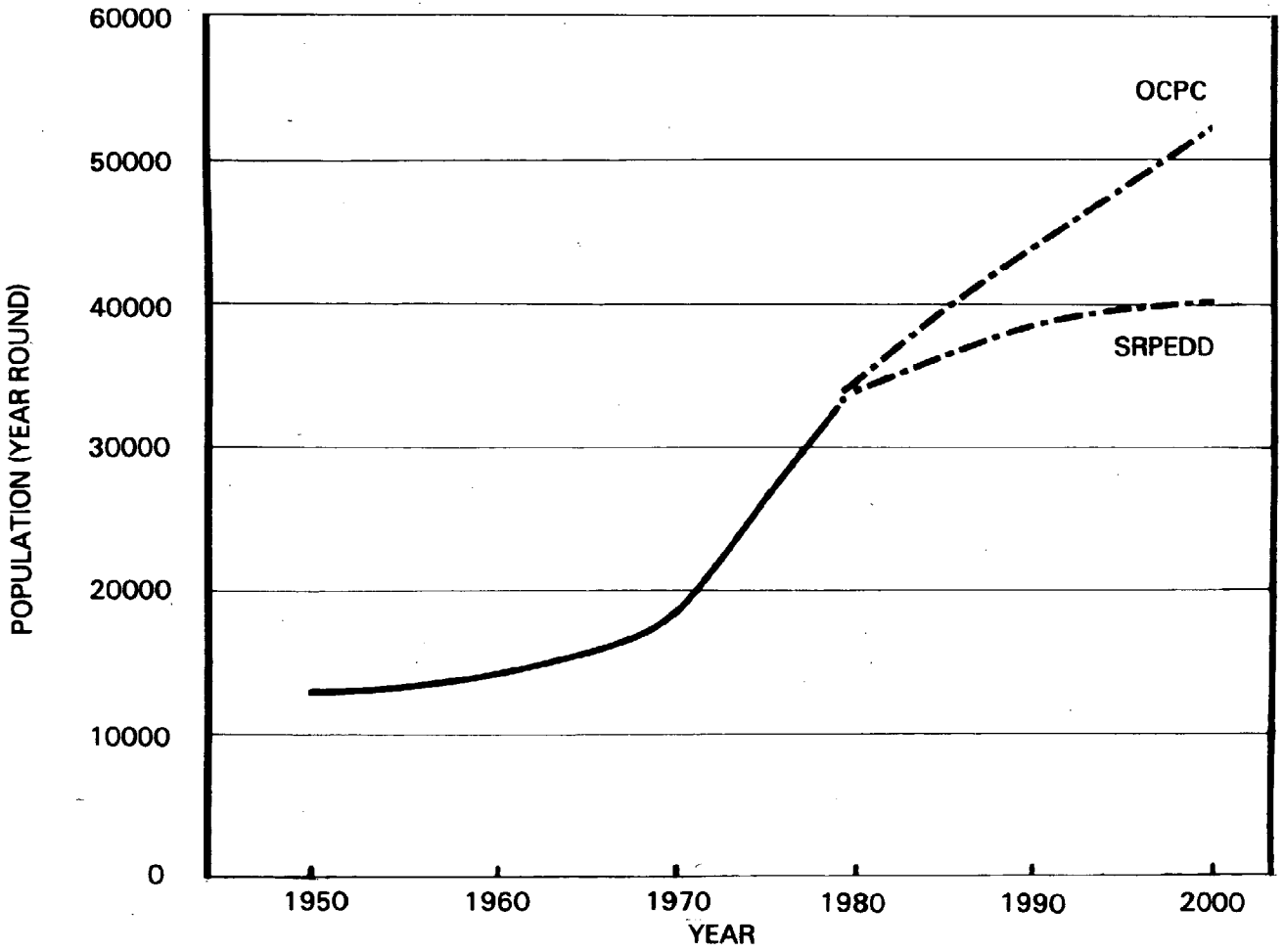
BASELINE PROJECTIONS WITHOUT PILGRIM II

A first step prior to application of the model is to establish a basis of comparison for Pilgrim I impacts. These are called "baseline" conditions and are projections of the types of growth that are likely to occur if the Pilgrim II plant is not built.

In order to be consistent with Plymouth's comprehensive planning process, growth parameters of population, employment, housing needs, and school enrollment through the year 2000 were utilized. The Technical Memorandum No. 1, Ranges of Future Demand, of the Plymouth Comprehensive Plan, dated 1979, contains these projections. These projections were based on a compilation of existing available data from local, regional and State sources. No independent projections were made except where modifications of available projections were necessary to extrapolate them to the year 2000 planning horizon. Technical Memorandum No. 4, dated 1979, includes a Public Facilities Analysis that translates these baseline growth projections into public facilities requirements. These projections and the resulting public facilities requirements were used as baseline conditions without Pilgrim II. Highlights of these technical memoranda are summarized below.

Population

Plymouth's population growth through 1978 is shown in Figure 2. The Town experienced a rapid increase in population



Sources: Old Colony Planning Council (OCPC) and Southeastern Regional Planning and Economic Development District (SRPEDD)

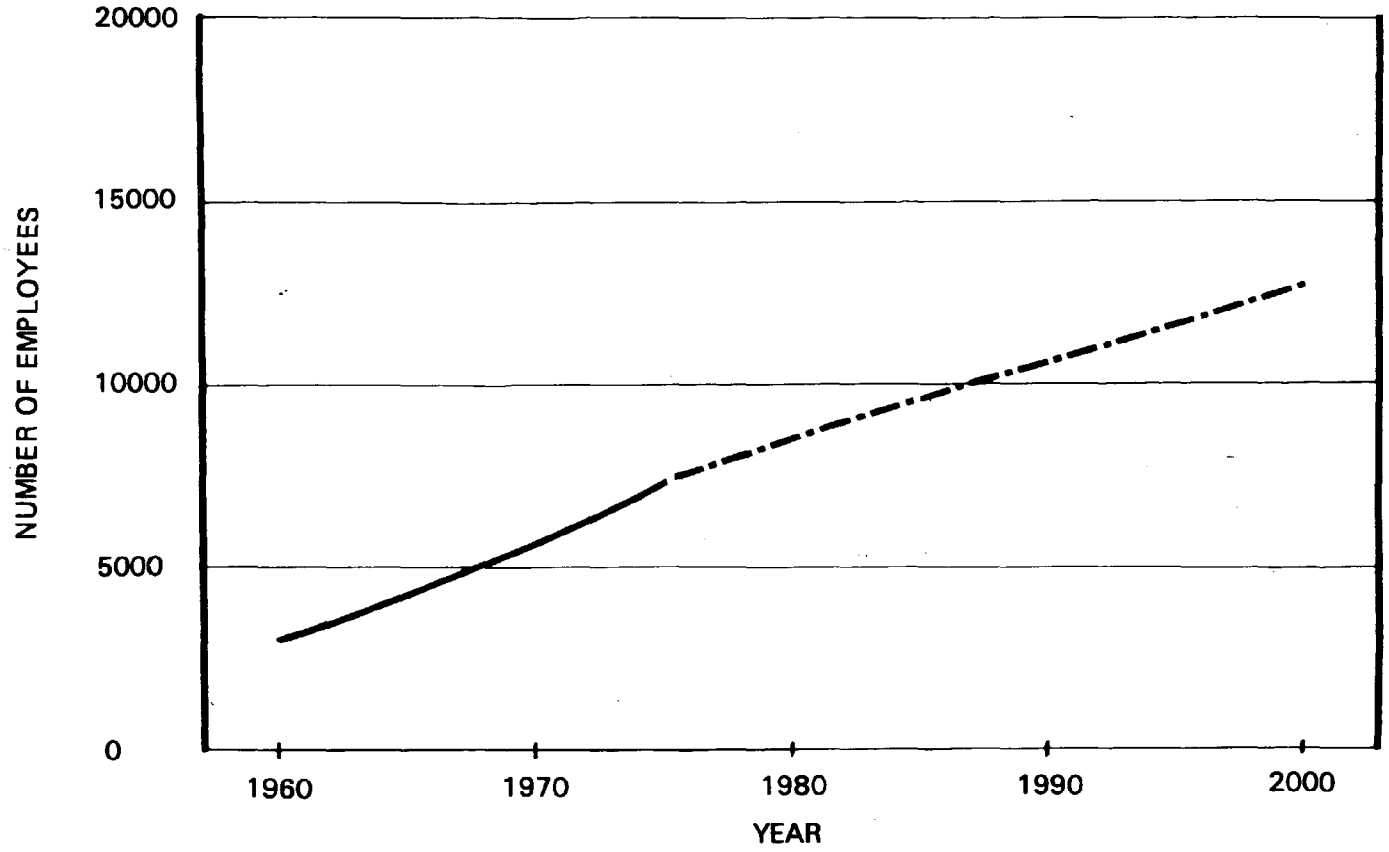
FIGURE 2. PLYMOUTH POPULATION GROWTH

growth beginning in 1965 and accelerating during the 1970-1975 period. During the 1970's, the Town grew more rapidly than the Old Colony Planning Council (OCPC) region or neighboring individual towns.(6)

Figure 2 also shows recent population projections that were prepared for the Town. The highest projection was prepared in 1975 by the Old Colony Planning Council based on a regression analysis of past trends. Since past trends included the 1970-1975 accelerated growth rates caused by Pilgrim I, the OCPC estimate is likely to be high, since the technique assumed a continuation of the Pilgrim I effect. The lower projection was prepared in 1977 by the Southeastern Regional Planning and Economic Development District, based on a disaggregation, from the regional to the local level, of 1975 Massachusetts Office of State Planning Projections. Each of the projections was extended through from 1995 to the year 2000 by straight line projections based on the rate of growth in the last year of the projection.(9) Since these projections were prepared without explicit consideration of the Pilgrim II plant, these projections are considered as "without Pilgrim II" projections. These projections indicate a future range of population of 40,000 to 52,500 in the year 2000.

Employment

Past trends and projections in total employment for the Town of Plymouth are shown in Figure 3. Past employment changes in Plymouth due to the Pilgrim I labor force are not reflected here due to data collection techniques which record utility-related employment in the area where the home utility company is



Source: Massachusetts Division of Employment Security

FIGURE 3. EMPLOYMENT GROWTH

based. Projections prepared for Plymouth by the Old Colony Planning Council show total employment for the Town on the order of 12,600 by the year 2000.

Housing

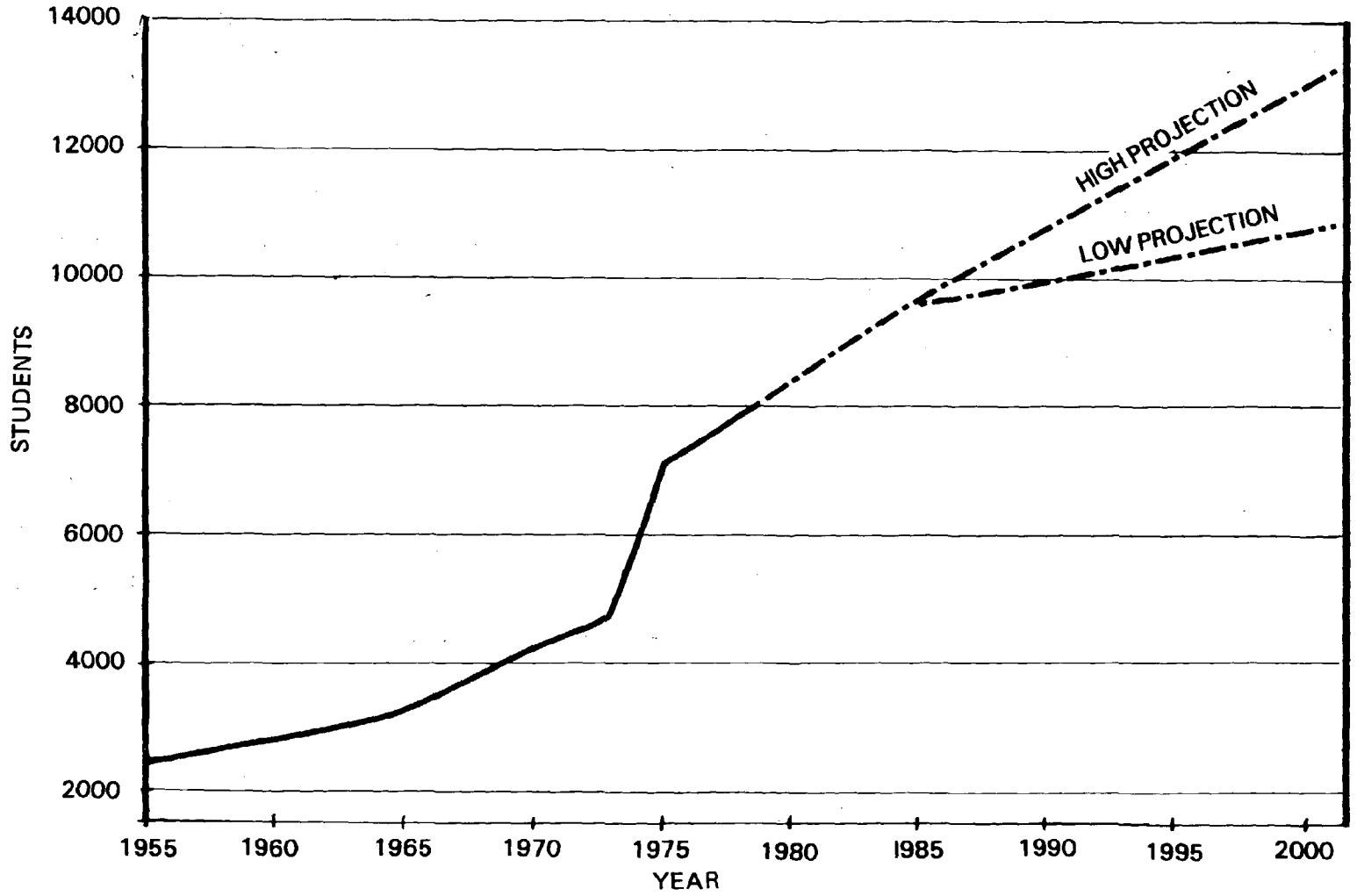
Estimated demand for housing in the year 2000 without Pilgrim II were based on projected population increases and the following:(9)

- The ratio of multifamily units to single family units would continue to be approximately 1:3.
- The population per single family unit would remain at 3.0 persons as reported for owner-occupied units in the 1970 census.
- The population per multifamily unit would be from 1.5 to 2.0 persons.
- The construction of seasonal homes would be insignificant in the future.

The resulting housing demand is 3,700 to 8,200 new units between the year 1978 to 2000. This represents an additional 160 to 350 units per year.

School Enrollment

Total student enrollment in 2000 under baseline conditions is shown in Figure 4, and is based on projections by the Plymouth School Department, New England School Development Council, the Massachusetts Department of Education and Metcalf & Eddy. The projections differ because of assumptions made about future birth and migration rates. These projections show a future school



Source: Massachusetts Department of Education, Plymouth School Department, NESDEC, Estimates by Metcalf & Eddy

FIGURE 4. SCHOOL ENROLLMENT

enrollment of 10,900 to 13,300, which is an increase of 2,900 to 5,300 over the 1978-79 enrollment of 8,000.

Public Facilities

These baseline growth parameters were used to project demands on major public facility needs for schools, the sewer system, and water supply. The basis of the projected demand for public facilities is detailed in Technical Memorandum No. 4, Public Facilities Analysis (1979). Estimated growth parameters and public facilities needs for the year 2000 are summarized in Tables 5 and 6, as baseline conditions for the future without Pilgrim II conditions.

TABLE 5. PROJECTED GROWTH WITHOUT PILGRIM II

Growth parameters	1978	2000
Population	31,000	40,000 - 52,500
Employment	8,100	12,600
Housing	12,000	16,000 - 20,000
School enrollment	8,000	10,000 - 13,300

Source: Technical Memorandum No. 1 "Ranges of Future Demand", Plymouth Comprehensive Plan, 1979.

TABLE 6. PUBLIC FACILITIES NEEDS
WITHOUT PILGRIM II

Public facilities	Needs, year 2000
Schools[1]	3-5 schools
Elementary	3 schools
Intermediate	(3,300 students)
High School	1 school
	(1,900 students)
Sewerage facilities	Improve existing treatment plant and rehabilitate existing sewers. 15-20 miles of new sewers and a treatment plant.
Water supply	Expansion of public well supplies to serve 15,000-20,000 additional persons. Extensive expansion of existing distribution system.

1. These estimates assume no growth management. Estimates of future Intermediate and Senior High School needs include allowances for the adjacent town of Carver of about 200 students each.

Source: Technical Memorandum No. 4, "Public Facilities Analysis," Plymouth Comprehensive Plan, 1979.

CHAPTER 6

DETAILED MODEL APPLICATION

In this section, the model is discussed in more detail and is applied to estimate growth impacts that could be expected in Plymouth with Pilgrim II. Quantitative values for growth impacts should be considered illustrative and are provided to give order of magnitude indications of growth effects. These effects are presented separately for the labor force and tax revenue.

Labor Force Impacts

Construction Phase. The labor force impacts are modeled after growth impacts that occurred with Pilgrim I. This appeared justifiable since the factors affecting the decision of Pilgrim II workers to move to Plymouth, namely, income, housing availability, and convenient access to construction work opportunities once the plant is completed are similar to the factors that affected decisions during the Pilgrim I construction period.*

The construction-related impacts were based on the following assumptions:

1. 16 percent of the annual average work force of 1,000 persons will need temporary housing in each year of the six-year construction period.(10)
2. Seven percent of the total work force of 7,100 will permanently relocate in Plymouth over the six-year construction period.(7)

*The energy crises may have affected the perceived accessibility of Plymouth to the Boston area job market. However, there is no significant evidence yet to suggest gasoline prices will exceed cost savings of buying a home in Plymouth as opposed to the suburbs closer to Boston.

3. The average household size for new households will be 3.0 persons.(9)

4. There will be an average of one school-aged child per household.(9)

5. The average annual construction wage will be approximately $25,000 ($20,000 after taxes) and will generate 1.2 jobs in the region due to the multiplier effect.(8)

6. For workers who move to Plymouth, approximately half of their expenditures are local and will thereby generate 0.6 jobs per worker locally.(11)

7. For workers who live outside of Plymouth, approximately $20.00 per week will be spent locally, thereby generating 0.06 jobs per worker locally.*

For Pilgrim II, Boston Edison estimates that an average of 1,000 persons per year will be working on Pilgrim II with a peak construction force of 2,000. The total work force (in man-years) for the six-year construction period will be 7,100.(7)

Approximately 160 workers and their families are expected to live in Plymouth on a temporary basis each year. These workers will generally be skilled workers who live too far to commute and who will typically be employed at the plant for less

*Secondary jobs do not generate significant population growth, housing demand or increases in school enrollment since employment opportunities in the retail and service sectors are relatively low paying and will generally be made available to existing residents of the area and will not be likely to result in decisions to relocate to Plymouth (11).

than a year. Throughout the construction period 160 household units will be the approximate number needed to house these transient workers. Some of this demand will be absorbed by existing vacant rental or sales housing. However, since the rental market is tight, the demand may create additional pressure for low rental units in the Town. Table 7 shows the temporary construction-related labor force impacts.

TABLE 7. TEMPORARY CONSTRUCTION-RELATED LABOR FORCE IMPACTS

Parameter	Annual temporary impacts(1)
Population	480 persons
Employment	1,141 jobs
Housing	160 units
School enrollment	160 students

1. These will occur in the first year and represent the approximate number of transient workers in Plymouth each year throughout the six-year construction period.

Permanent labor force impacts measure the number of worker households who move to Plymouth during the years when construction is underway. Many of these workers may live within commuting distance but will choose to relocate due to opportunities for affordable housing, reduced travel time to work and other desirable residential characteristics of the Town. Table 8 shows permanent construction-related labor force impacts.

Operation Phase. During the operation phase, Pilgrim II will employ 175 technical personnel. Boston Edison estimates

that over 50 percent of these workers will relocate in Plymouth.(10) Assuming 100 worker households will be relocating (57 percent), the impacts will be as shown in Table 9. These impacts are assumed to occur once the plant is operational.

TABLE 8. PERMANENT CONSTRUCTION-RELATED LABOR FORCE IMPACTS

Parameter	Annual permanent impacts due to worker relocation	Cumulative (net) impacts at end of construction period
Population	250 persons	1,500 persons
Employment	50 jobs	300 jobs
Housing	83 units	500 units
School enrollment	83 students	500 students

TABLE 9. OPERATION PHASE LABOR FORCE IMPACTS

Parameter	Net impacts(1)
Population	300 persons
Employment	240 jobs
Housing	100 housing units
School enrollment	100 students

1. As of first year of operation and throughout life of plant.

Table 10 summarizes the permanent growth impacts attributable to the labor force during construction and operation.

TABLE 10. SUMMARY OF PERMANENT LABOR FORCE GROWTH IMPACTS

Growth parameters	Total of construction and operation phases
Population	1,800 persons
Employment	540 jobs
Housing	600 housing units
School enrollment	600 students

Tax Revenues

The Pilgrim II plant will provide substantial tax revenues to Plymouth and is likely to accelerate growth in the 1980's. To project these growth impacts, it is first necessary to look at the fiscal situation in the Town.

The total assessed value of nonexempt real and personal property tax base for Plymouth is currently $922 million. By the time Pilgrim II plant, valued at $1 billion, is completed (probably 1987), the plant value will cause the total assessed value of the Town to double. This will provide the Town with assured revenues between $14 and $20 million dollars.*

*Revenues are based on discussions with the Plymouth Tax Assessor and Boston Edison. At present, it is difficult to estimate the exact amount of revenues that will be generated by the plant, since utilities in Massachusetts are no longer taxed according to traditional property tax formulas.

The justification for estimating the tax effects on growth rates based on Pilgrim I's experience is that few of the community characteristics that could influence the magnitude of growth induced by tax revenues have significantly changed, specifically:

- Fiscal Environment: Plymouth still relies on the property tax for most of its local revenues. Unless future State policy includes redistribution of revenues from public utilities or puts a cap on the amount of revenues that can be raised with property taxes, the relationship between changes in taxes and growth rates is likely to continue.
- Accessibility: The energy crisis may have affected the perceived accessibility of Plymouth and other South Shore communities to the Boston job market. However, there is no definite evidence yet to suggest that gasoline prices will exceed cost savings of buying a home in Plymouth as opposed to suburbs closer to Boston.
- Land Use Controls: Plymouth presently has more stringent land use controls than existed in the early 1970's. However, Plymouth's local land use controls are not viewed as more restrictive than those of neighboring communities, and therefore are not a significant constraint to development. However, when land use controls identified in Plymouth's comprehensive planning program are implemented, Plymouth may be more restrictive than neighboring communities.

- Housing and Land Costs: New housing in Plymouth is still relatively lower priced in comparison to other neighboring communities.(13)
- Land Availability: Plymouth is the largest town in the State and the availability of developable land will not be a constraint to development in the forseable future.
- "Image": The Town continues to enjoy the image as a family community, due to its good schools and extensive recreation facilities, particularly attractive beaches.

One additional factor that could inhibit growth due to tax revenue benefits is the issue of nuclear plant safety. Although a recent study has shown that fear of plant-related health and safety factors has not influenced residential location decisions within 20 miles of Plymouth, public attention to nuclear "accidents" such as Three Mile Island may moderate growth rates to a minor extent. Our estimate of increase does not reflect any change of attitude caused by the safety issue.(12)

Total Growth Impacts

The total growth impacts include the labor force and tax revenue impacts over the period of construction (approximately six years) and the first three or four years of operation. Figure 5 shows the projections with Pilgrim II for the population. They are based on the assumption that temporary and permanent labor force impacts begin in the first year of construction and last through year six; tax-revenue induced growth

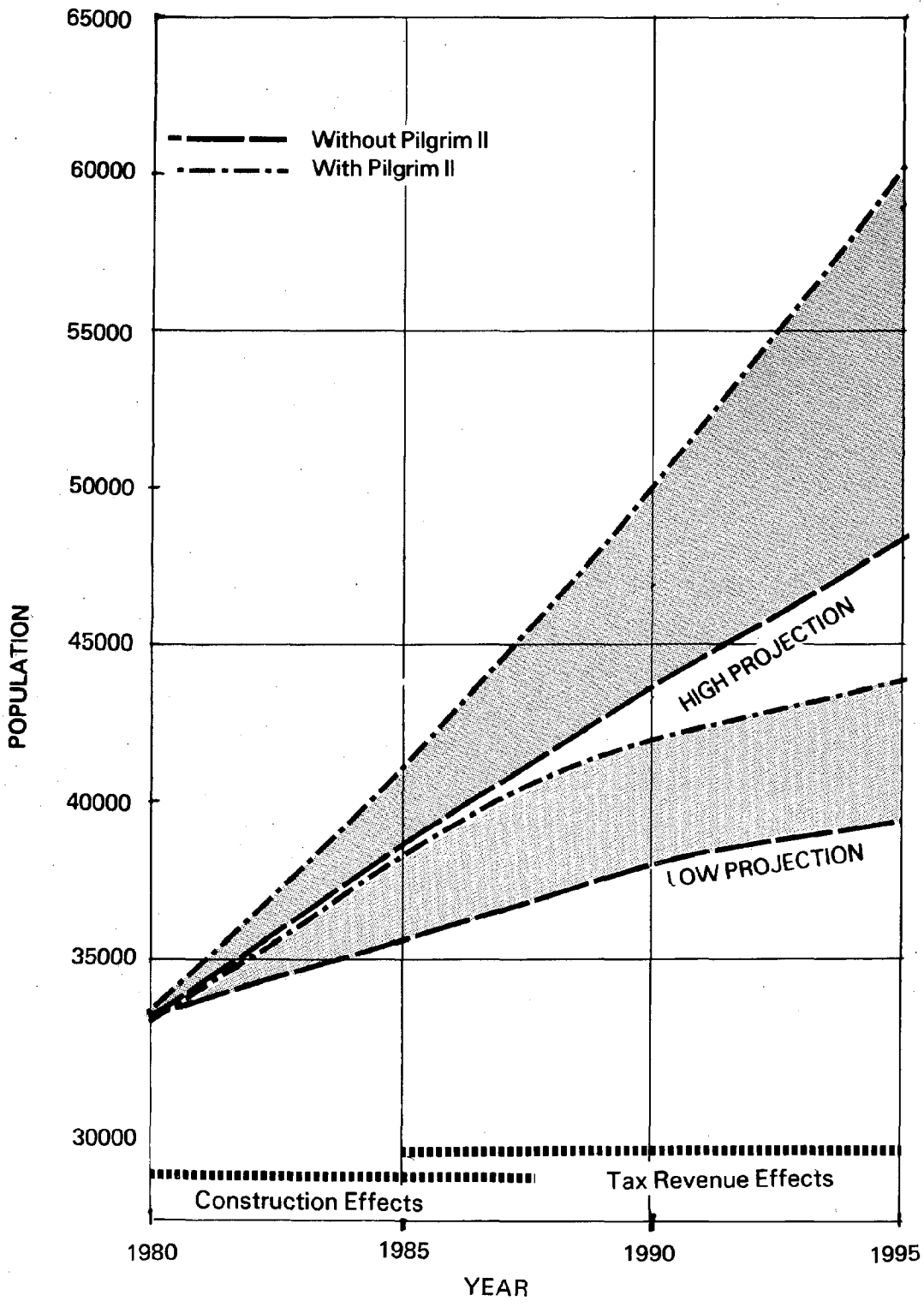


FIGURE 5. ADDITIONAL POPULATION DUE TO PILGRIM II

occurs once the plant begins to generate significant revenues (and attention is drawn to those fiscal impacts on the Town).*

The figure highlights the time periods when Plymouth will experience the most significant growth impacts: the first year of construction, when temporary and permanent labor force immigrants add over 730 new residents to the Town and the last two years of construction, when labor force and tax revenue-induced growth impacts overlap. Impacts extend through 1995.

By the year 2000, the population range will have increased by 4,760 to 12,560, to a new projected range of 44,760 to 65,060.

The population changes represent an additional 1,600 to 4,200 units of housing and 1,600 to 4,200 additional school students. One hundred seventy-five plant-related jobs are the net increase in employment, as are 950 to 2,520 multiplier jobs.

All growth parameters will increase in the same pattern as population, with most of the construction-related changes preceeding the tax revenue related increases.

Tables 12 and 13 summarize the baseline and revised projections for growth parameters and public facilities needs.

*Tax revenue induced growth impacts may possibly begin slightly earlier since buyers, sellers and brokers may act in anticipation of revenues. This may be mitigated by the more sophisticated attitudes of potential home buyers toward nuclear power plants.

TABLE 12. CHANGE IN GROWTH PARAMETERS DUE TO PILGRIM II

Growth parameters	Year 2000	
	Without Pilgrim II	With Pilgrim II
Population	40,000-52,500	44,760-65,060
Employment	12,600	13,725-15,300
Housing	16,000-20,000	17,600-24,200
School enrollment	10,900-13,300	12,500-17,500

TABLE 13. PUBLIC FACILITIES NEEDS DUE TO PILGRIM II

Public facilities	Projected needs - Year 2000	
	Without Pilgrim II	With Pilgrim II
Schools		
Elementary	3-5 schools	5-6 schools
Intermediate	3 schools	4 schools (4,400 students)
High school	1 school	2 schools (2,500 students)
Sewerage Facilities	Improve existing treatment plant and rehabilitate existing sewers. 15-20 miles of new sewers and a treatment plant.	Same as baseline except 20-25 miles of new sewers and a larger treatment plant.
Water Supply	Expansion of public well supplies to serve 15,000 - 20,000 additional persons. Extensive expansion of existing distribution system.	Same as baseline except well supplies should be expanded to serve 18,000 to 30,000.

CHAPTER 7

EVALUATION OF GROWTH IMPACTS AND RECOMMENDED MITIGATING MEASURES

As discussed in Chapter 6, the Pilgrim II plant will cause growth impacts in population, employment, housing and school enrollment in Plymouth, and additional public utilities will be required to service this new growth. The purpose of this chapter is to evaluate the Pilgrim II growth impacts and to identify measures to mitigate impacts which are considered negative.

The measure of whether an impact is negative or positive is determined by the degree to which it supports or frustrates Town goals. Therefore, the first section of this chapter discusses the Town goals and the effect of Pilgrim II impacts upon them. Following that discussion is a section on recommended mitigating measures and an appropriate schedule for implementation.

Effect on Town Goals

In April 1978, after a year of work by the Planning Board and Selectmen, the Plymouth Town meeting adopted the report "Goals for Plymouth".(14) This report was to serve as the policy foundation for continued comprehensive planning for the Town.

The goals are divided into the six major subject areas of:

- growth management
- tax rate control
- economic development

. Town Center/Waterfront

. public facilities needs

. Village Centers concept

In each subject area, there was identified a set of specific goals and objectives. Table 14 presents those goals (paraphrased and summarized) which are potentially affected by Pilgrim II and identifies the degree of that effect, absent of any mitigating measures. The effect is based on the growth impacts of the plant as described in Chapter 6 and on the plant's revenue characteristics.

The plant will frustrate many of the Town goals primarily due to the population increase it will encourage. This increase will have a negative impact on the growth management, public facilities and Village Centers concept goals due to the lack of adequate mechanisms presently in place in the town to adequately manage this expected development. The plant will have a strong positive impact on municipal revenues and employment opportunities.

Mitigating Measures

The mechanisms to mitigate many of the adverse effects on Town goals are available and under consideration by the Town as part of their comprehensive planning process. The central objective of these measures is to control the amount, location and rate of growth consistent with the Village Centers concept and the goals of tax rate control, provision of adequate public facilities and economic development.

TABLE 14. EFFECT OF PILGRIM II
ON TOWN GOALS

Goal	Effect
A. Growth Management	
1. Control the rate of growth	strong negative
2. Guide, minitor and respond to growth and change in an efficient manner	negative
3. Manage growth to preserve environmental resources	negative
4. Insure high quality of growth	negative
B. Tax Rate Control	
1. Stabilize tax rate	positive
2. Increase municipal revenues	strong positive
3. Minimize demands on resources	negative
C. Public Facilities	
1. Optimize use of public facilities within existing resources	negative
D. Economic Development	
1. Improve economic opportunities	strong positive
2. Increase governmental facilities for economic development	neutral
E. Town Center/Waterfront	neutral
F. Village Centers Concept	
1. Shape future growth around Village Centers	negative

Effective implementation and enforcement of these mechanisms should attain growth management, irrespective of the cause of that growth. It is therefore believed that many of the adverse growth-related impacts of Pilgrtim II will be generally minimized by these town-wide growth control measures. While Pilgrim II will exert supplemental growth pressure, these town-wide growth management measures are expected to mitigate it.

In addition to the town-wide measures, there are special measures which are necessary to mitigate adverse effects which are unique to Pilgrim II. Both the town-wide and special measures are discussed below.

Town-Wide Measures. There are a number of techniques for managing the amount, location, rate and timing of growth which are presently under consideration by the Town. These are discussed in Technical Memorandum, Task 3, titled "State of the Art Review of Growth Management Systems", prepared by Robert H. Frielich and Associates, dated October 1978, and Legal Memorandum No. 1 (including Technical Memorandum No. 3) titled "Growth Management Approaches" prepared by Freilich & Leitner and Metcalf & Eddy, dated October 26, 1979. These two documents present and evaluate growth management systems which might be appropriate to implement the Plymouth goals. They are briefly summarized below.

1. Numerical Restraint. This approach would limit the amount or rate of growth which could occur either in total or annually, but does not specifically address locational aspects. Techniques involved may range

from total population or dwelling unit caps achieved through widespread "downzoning" (rezoning to require lower densities) to annual building permit limits.

2. Geographical Restraint. This approach directly regulates the location of development by identifying an area or areas where development is to occur or not occur. Generally, but not always, these systems are based on a capital improvements program for public facilities which defines service limits as the geographical restraint line.

3. Adequate Public Facilities Requirements. This approach focuses on the availability of facilities and services necessary to support development rather than directly regulating the amount, location or rate of development. It usually consists of criteria for the most essential public facilities, such as schools, fire protection, sewer, water and roads, which must be available before a development is approved. Utilizing this approach requires heavy reliance on a capital improvements program to determine where and when these facilities are provided and therefore, where, when and in what amount growth is to occur.

4. Downzoning. This approach limits the amount and rate of growth by reducing, through zoning the allowable density of an area, or conceivably the entire town.

It does not specifically control the location of development which does occur. On a town-wide basis, this approach would be vulnerable to successful legal challenge.

5. Purchase of Development Rights. This approach involves first, the separation of the right to develop land from the right of ownership, and sale of the right to develop to the Town or other group which would not exercise these development rights and would preserve the property in its natural state. This is an effective way of taking land out of the market, yet at the same time, compensating the owner for the loss in value. This approach should also be utilized in combination with a reduced real estate tax of the property. Needless to say, this approach is costly and, as a result, implemented on selective locations. However, the tax revenues produced by the Pilgrim II plant make this approach reasonable for Plymouth. These revenues could be used to purchase development rights necessary to achieve Town goals.

6. Existing Land Use Regulations. The existing land use control system, while deficient in being able to mitigate Pilgrim II impacts, provides an adequate foundation to adopt the above types of regulations. In addition, the existing zoning by-law is based upon

the Village Centers concept and therefore enhances that Town goal. This and the existing regulations and practices are also quite effective in the protection of the Town's environmental resources.

The process of evaluation and selection of these approaches and where and how they will be applied in Plymouth is presently in process. This evaluation and subsequent action should result in adoption of a town-wide growth management system at the April 1980 town meeting.

Mitigating Measures Unique to Pilgrim II. There are a number of measures, not expected to specifically be part of the town-wide growth management system which would tend to enhance the positive impacts of Pilgrim II and reduce the negative effects. These are discussed below.

To reduce growth due to the relocation of construction and operation personnel in Plymouth, the Town should encourage Boston Edison:

1. To recruit construction and operation workers from within commuting distance and provide, in cooperation with local unions, a job training program as needed to local job applicants so that they can obtain skills necessary to work at the plant;
2. To require Boston Edison to provide mobile homes for households on their property. This would reduce the pressure on the rental housing market and the units could be removed when the plant is complete;

3. To provide a van- or car-pooling program for construction workers who might consider relocating to Plymouth as an alternative to a long daily individual commute by automobile.

The Town, either through its own agencies (e.g., Industrial Development Commission) or private groups (Chamber of Commerce), should also avoid publicity that gives potential homebuyers the expectation of getting more for their money by living in a Town where two nuclear plants provide substantial tax revenues.

Schedule for Mitigating Measures

It is expected that the town-wide growth management system will be placed before the 1980 Town Meeting for enactment. This positive action would effectively implement the most substantive aspects of the mitigating measures and well in advance of the Pilgrim II growth pressures.

Discussions regarding the measures unique to Pilgrim II should begin with Boston Edison immediately.

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APPENDIX

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