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# Fiscal Impacts Associated with Power Reactor Siting: A Paired Case Study

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Prepared for the
U.S. Nuclear Regulatory Commission
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# FISCAL IMPACTS ASSOCIATED WITH POWER REACTOR SITING: A PAIRED CASE STUDY

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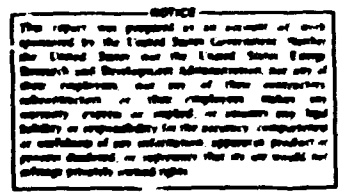

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## FOREWORD

This paper reports on initial efforts at the Oak Ridge National Laboratory to investigate the interactions of nuclear-powered electrical stations and the local public economy. In conducting this research, it was found that although a rather broad literature on public impacts exists only minimal past attention had been focused on power reactors. Consequently, a rather mixed foundation was available as a starting point. With this in mind, the present offering, the first in a series reporting on this subject area, has been designed to serve as a brief primer on issues relating fiscal impact analysis to reactor siting, as well as a report on findings gathered by studying communities hosting two New England power reactors. Thus, several topics are discussed in more detail than would be in the case in a more developed topical area, with the hope of improving on the generally inadequate treatment given institutional considerations in previous work on this topic.

In the interest of brevity, this report will not retrace the past literature, particularly since this has recently been done in an Urban Institute series that deals generally with social, economic, and fiscal impacts of land use change.[1] The interested reader may find these papers relevant to the present topic and will also find a more extensive bibliography than contained herein.

There is also a similarity between the topical content of this report and recent work published by Argonne National Laboratory, which is attempting to develop a framework for analyzing local impacts from energy resource development.[2] In contrast to the Argonne activities, the present report has the more modest goal of presenting a framework through which clear conclusions may be drawn regarding the principal fiscal impacts of reactor siting. Succeeding papers in this series will be more compact and sometimes more formal, with the overall goal of contributing to the development of a body of literature that will aid in sorting out the complex issues surrounding reactor siting and the local public economy.

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The full case study of community impacts from nuclear power stations may be found in another ORNL publication, *A Post Licensing Case Study of Community Effects at Two Operating Nuclear Power Plants*, B. Purdy, E. Peelle, D. Bjornstad, et al., 1976.

## ABSTRACT

This paper examines the fiscal impacts associated with siting nuclear-powered electrical stations. First, a framework for examing fiscal impacts is constructed. This framework consists of four elements: the ability of a local community to raise revenues, the degree to which this ability is used, the uses to which tax revenues are applied, and the effect of tax/expenditure decisions on the local economy. Changes in these four elements caused by the siting are termed fiscal impacts. Second, this framework is applied to two communities, Waterford, Connecticut and Plymouth, Massachusetts, which host operating reactors. In each community the ability to raise revenues through the property tax – the prime local revenue source – approximately doubled. As a result both communities chose ultimately to reduce tax rates. Moreover, it appears that the annual revenues raised through the public sector as a result of the reactor siting exceeded income changes that resulted from increased local employment associated with each reactor's operation. It therefore appears that for these two towns, the primary economic impact occurred through the public sector. Finally, the report concludes with suggestions for further research into local fiscal and economic effects associated with power reactor siting.

# 1. INTRODUCTION

The manner in which host communities are affected by the siting of a nuclear power station is a matter of rising concern because of the increased use of nuclear energy as a source of electricity. This study focuses on the economic impacts of reactor siting felt by local governments. The purpose of the study is to develop a research framework and to apply this framework to two actual siting experiences. It is thus intended to provide a basic foundation for work that will further probe the fiscal impacts of the facilities, but is not designed to encompass all economic effects.

Past efforts at assessing the economic impacts of power reactors have tended to focus on job creation and attendant income effects. The concensus reached from such studies is that a significant number of jobs are created during the construction phase, but that the weight of this impact is broadly spread over a commuting region extending well beyond the bounds of the host community. During the operating phase following construction, power stations are typically maintained by a relatively small work force. These studies, therefore, imply that the economic impact on the host community is relatively small.

The present study differs from this research, because it attempts to measure the economic impact of the power station through the local revenues derived from the facility and the level of public services required to support the facility. The primary anticipated fiscal impact is a large increase in the property tax base, which occurs because the station is likely to be located in a sparsely-populated area. As will be seen below, this expectation is borne out. On the cost side, one might anticipate the facility to make a number of service demands. However, this research has found virtually no service demands associated with either construction or operating phases. Thus, the analysis breaks into four major parts: (1) determining the increase in taxable capacity that occurs through the expansion of the property tax base; (2) examining the degree to which the increase is absorbed into the local public sector; (3) considering expenditure changes that can be associated with the tax rate change; and (4) deducing the impacts on the private sector.

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This report centers on the communities of Plymouth, Massachusetts and Waterford, Connecticut and the influence the Pilgrim and Millstone power stations have on their respective towns. This research is part of a larger inquiry into the range of social impacts associated with power reactor siting.[3] These two communities were chosen for study because of regional and demographic similarities prior to the start of construction, and because, at first glance, it appeared that significantly different development patterns had occurred that might be traced to the construction and operation of the power reactors. Plymouth grew rapidly in population, while Waterford remained nearly constant in size. Presumably, if significant economic changes accompanied the siting, an impetus for other social and economic change might follow. These latter considerations, however, will be examined in a separate volume.[4]

The remainder of this report is divided into three sections. In the first, the concept of economic and fiscal impacts is discussed in terms of past research, and the analytical format is described. The second section contains the empirical analysis, including the magnitude of the tax base changes that occurred and the manner in which each town reacted to the change. There is also a discussion of the implications of tax rate increases and decreases for local disposable income. The final section contains the summary and conclusions and a discussion of the directions further research into this topic might take.

## 2. THE CONCEPT OF ECONOMIC AND FISCAL IMPACTS

### 2.1 Introduction

Economic impacts include: (1) changes in the overall income, employment, and output of an area; (2) changes in the distribution of these elements; and/or (3) changes in the relative prices of local goods and services that can be linked to a single event (e.g., the siting of a nuclear power station). It is often useful to consider construction and operating time frames separately, but for this analysis, a different distinction has been drawn. This divides the local economy into private (business and household) and public (government) sectors. Because past

research has often focused on the private economic sector, and, in general, has established only minor linkages between the private sector and the siting of a power reactor, a decision was made to center present efforts around the public sector in an effort to identify fiscal impacts. Empirical efforts have therefore been greatest in this area, with reliance on past research supplemented with interviews of local residents, for information concerning private sector impacts.

## 2.2 Past Research

Few studies have extensively examined the fiscal impacts of power station siting, and the majority of these have performed relatively cursory analysis. Nonetheless, power stations are generally credited with creating substantial benefits for the governments of impacted communities.[5,6] Unfortunately, the casual treatment given this topic has sometimes not permitted a clear statement of this conclusion. For example, in an analysis considering the anticipated impacts of the Martin Plant in Florida, James C. Nichols concluded, "If the plant... (when completed) is valued in the neighborhood of $114,000,000, then the total revenues gained will more than cover all public costs."[7] The Nichols analysis is based on the following assumptions: (1) that the value of the plant cannot be anticipated; (2) that the costs of educating additional students will be equal to the average costs of present ones; (3) that families which move in will generate no accompanying economic development; (4) and that the tax rate will remain constant. Under these conditions, Nichols forecasts that revenues generated by new housing would pay for only about one-third of the cost of educating the additional number of students and would also fail to cover other public service costs. He, therefore, calculates the "necessary" plant value as that which would balance the cost deficit, but omits from his analysis the fact that for nonmetropolitan areas in Florida, state aid to school districts accounts, on the average, for about two-thirds of general revenue. Including this factor, his calculations would suggest that almost no revenues would be needed from the plant in order to cover the direct and indirect costs it would generate.

A second example can be drawn from a discussion of "tax benefits" in which John S. Williams and Stephen Spigel argue that the added tax revenues attributable to the siting of a power reactor at Oyster Creek, New Jersey – some $1.8 million in 1973 – have resulted in "major tax savings to residents" by noting that Lacey Township has experienced a significant tax rate decline.[8] However, the authors also note that Lacey has held two reevaluations during this period. Since the effect of a reevaluation is to increase the amount of assessments on the tax roll, resulting in a situation in which a smaller tax rate brings in a larger amount of revenue, this result is hardly surprising. It is therefore difficult to evaluate their conclusion regarding the size of the tax rate decline and its relation to the power reactor.[9]

Often inadequate information has limited the scope of conclusions regarding fiscal impacts. In the face of inadequate data from which to estimate more appropriate parameters, analysts usually assume that variables which have increased more or less regularly over the past few years will continue to grow at an average rate and assume that variables which can either increase or decrease will remain at their most recent level. For example, when Harbridge House analysts attempted to model Montague's fiscal future, they disaggregated budget items and applied individual average growth rates,[10] arriving at the conclusion that the tax rate would grow from its existing level of 59 mills to a level of 117 mills by 1985, without the relief of the proposed plant.[11] This conclusion abstracts from the behavior of the other economic activity in the town, assuming simply that assessed valuations would grow at a rate slightly less than 5 percent annually. It does not, however, make clear the degree to which the gross output of the town would have been drawn additionally into the public sector, since it uses nominal instead of real tax rates, a point discussed further below.

In general, previous analyses of fiscal impacts related to reactor siting have been weakened by a failure to organize key public sector variables properly and by a failure to relate public sector activity to private sector activity. This leads to confusion in several areas, and most previous research falls victim to at least one such area. First, real and nominal aspects of the property tax system are sometimes interchanged. The basis of

property tax revenues are property tax assessments, which, in turn, are linked to market determined values of real property. Examining any one of these variables, in the absence of the others can lead to improper conclusions.

Second, there is a tendency to disassociate tax rate levels from the tradecff between public and private goods. When all else is equal, the cost of a lower tax rate is a decrease in public services, and the benefit is the ability to purchase additional private goods with the proceeds of the reduced tax liability. However, the particular public service/private service mix is substantially dependent on the underlying characteristics of the community in question. For example, communities subject to immigration typically possess disproportionately large numbers of children to be educated, owing to the age-specific character of migration, whereas more stable communities tend to have fewer school-aged children. Since the number of school-aged children is a prime determinant of education expenditures, which, in turn, is a prime determinant of the property tax rate, analytical adjustments may be necessary to permit inter-community comparisons of seemingly simple variables.

Third, previous studies have often implicitly implied that public and private sectors operate independently of one another, when, in fact, adjustments in each trigger predictable changes in the other. This can lead to concluding that fiscal impacts are reflected only in tax rates, whereas, in fact, they can lead to important employment changes. Thus, the simpliest single variable in the property tax system may be thought of as a link to all other elements of the local economy, and failure to do so can lead to inappropriate conclusions.

## 2.3 A Framework for Analysis

To aid in avoiding the above difficulties, this research divides the analysis of the local public sector into four components: (1) the ability of a community to raise tax revenues (taxable capacity); (2) the rate at which this ability is utilized (the tax rate); (3) the uses to which tax revenues are applied (the expenditure mix); and (4) the impact of tax expenditure decisions on the local economy (multiplier effects). Changes in these components attributable to the siting of the power station will

be termed its fiscal impacts. Because these components can be measured annually, no distinction will be drawn between construction and operating timeframes. Moreover, since budget officials in neither community could specify any direct town expenditures on the behalf of the power stations, further inquiry into this area was not conducted.

### 2.3.1 Taxable capacity

Taxable capacity measures the relative ability of governmental jurisdictions to raise revenues under a given taxing structure (i.e., with a given definition of tax base). In the Plymouth and Waterford cases, the primary tax base is the assessed value of nonexempt real and personal property. Because the physical capital of the nuclear generation unit is eligible for this type of taxation when the unit is not owned by a government entity, construction of a power reactor significantly enhances the capacity of the host town to raise revenues. In other words, a given tax rate will generate a proportionately greater amount of revenues according to the percentage increase in the property tax base.

The opportunity for a significant increase in taxable capacity derives from two characteristics of power reactors: (1) large capital investment and (2) location criteria which gives priority to low population density and high water availability, as well as proximity to electricity demand. Thus, unlike many industries which locate near potential markets or labor supplies, utilities have recently sited power reactors in relatively low population areas, providing the conditions for an almost certain massive increase in taxable base capacity. However, siting has also generally been near enough to labor markets to permit many construction workers to commute daily. Since the plant does not require additional public services in significant amounts, hire appreciable numbers of workers or purchase important quantities of local goods and services, the major direct impact during operation will be its effect on the tax base.

### 2.3.2 Tax rate determination

Once the increase in taxable capacity from the station has been entered onto the tax role, the community is in a position to make a decision regarding its use. It does not follow, however, that revenues will automatically

rise or that the existing tax rate multiplied times the capital investment adjusted to assessed value will predict future revenues accurately. The town may well choose to lower its tax rate in response to the increase in capactiy.[12] In doing so, it can recover the benefits (or a fraction of the benefits) of its taxable capacity increase through the private sector, since the lowering of the tax rate effectively leaves additional dollars in the hands of taxpayers.

To understand this issue, it is useful to state the four steps in levying the property tax. First, the property tax base is defined as comprising real property and certain personal property items. All eligible parcels in the community are placed on a tax roll, with provision for the forgiveness of taxes on certain properties (tax exemption), and a value is determined for tax purposes. Usually, the value determined in the market place, the so-called market value, is the guideline for assessment, but often the law or local convention defines a percentage of market value as the value for tax purposes. This percentage is called the assessment ratio. Next, the revenue requirements of the community are determined and all other revenue sources are subtracted from this figure, leaving a residual to be raised through property taxation. Finally, this revenue amount is divided by the total value of assessments to determine the tax rate.

Note, however, that two proportional elements enter into this process: (1) the assessment ratio – the ratio of assessed value to market value – and (2) the tax rate – the ratio of desired revenue to assessed value. Either of these ratios may change over time, and the value of each is necessary to determine the real or effective tax rate – the rate which is levied on market value. The tax rate on assessed value, termed the nominal tax rate, is published and easy to compare from year to year. On the other hand, the assessment ratio, which determines the rate at which market value is taxed is difficult, and often impossible, to obtain. This latter ratio commonly changes from year to year, typically as a result of changes in market value which the assessor does not fully record.[13] Under such conditions, the rate at which assessed value is taxed provides a poor measure of changes in the tax burden, particularly between jurisdictions.

Also, the relation between market and assessed value within a single jurisdiction may shift significantly over time. A common method for periodically adjusting assessments that have fallen behind the growth of market value and also for correcting inequities among parcels of property is termed a reevaluation, in which the assessed values of all parcels on the tax roll are adjusted to a new market value standard. While certain properties may receive a lower value following the process, generally the overall level of assessments rises following a reevaluation, or, in other words, the assessment ratio rises. Inasmuch as the larger level of assessments is on the tax roll following the reevaluation, the same amount of revenue can be raised with a lower tax rate, even though the "tax burden," as measured by the effective tax rate, remains the same. Thus, comparisons of nominal tax rates within a jursidication over time can also be misleading.

### 2.3.3 The increase in taxable capacity associated with the power station

The manner in which the value of the power station is translated into taxable capacity can also affect the station's fiscal impact. As was noted, the land, plant, and equipment of electrical generation stations is subject to property taxation in both Massachusetts and Connecticut. Additionally, inventories and subcontractor's equipment are entered onto the tax roll in varying amounts. The value of these items can be reduced through an exemption on equipment used to mitigate air pollution or environmental damage. Finally, the value is further modified through the application of an assessment ratio, with the final amount equal to assessed valuation for tax purposes. All of these calculations appear quite straightforward, at least in concept. In practice, however, three difficulties arise in reaching this value.

First, although there are several methods to arrive at the market value of a parcel of peoperty, all of which are theoretically equivalent, the typical tax assessor rarely encounters an installation as unique as a nuclear power reactor. In fact, the assessment of public utility property as a class is so complex that in 29 states a state agency is charged with its assessment, and in only 11 states is the local assessor wholly responsible for its assessment.[14] Connecticut and Massachusetts fall into this latter group.

Of the three most prominent methods for affixing value – the sales method, capitalized income method, and replacement value net of depreciation (net worth) method – only the last is generally considered appropriate for such unique structures as power stations. Application of the sales method requires data on sales of comparable parcels, and utility properties are rarely sold. Capitalized income is ususally considered inappropriate, for public utilities generally negotiate income with a regulatory agency. The net worth method of appraisal, in essence, requires the development of a reconstruction schedule based on current prices and development of a depreciation schedule that reflects the effects of physical and technical obsolesence. Preparing such schedules, particularly for a power reactor, is a specialized task, and often the cost schedule of the utility is the basis on which net worth is based.

Second, the provision of exemptions for equipment used to protect the environment is open to broad interpretation, since a significant share of total costs is consumed by the cooling system. Ascertaining which portion of plant equipment forms an integral part of the reactor's heat transfer system and which portion is environmentally related is an extremely difficult task.

Finally, there is the matter of establishing the appropriate assessment ratio for application to the market value of the facility. In principle, one would apply the assessment ratio used for all other parcels in the community. However, as was discussed above, tax assessors commonly do not attempt to maintain the assessment ratio at a constant level over time, preferring to expend the bulk of their efforts at maintaining equity among parcels and to correct the assessment ratio periodically through general reevaluations. This suggests that applying the legal assessment ratio may overstate the value of the power station relative to other properties and, in consequence, impose a disproportionate share of the total tax burden on the station. Moreover, once a ratio is settled upon, it may be inappropriate to recalculate value each year based upon current prices. This adjustment should properly be made at the same time reevaluation of other parcels takes place.

In both Plymouth and Waterford, the net worth method is used to arrive at a market value figure for the power reactor, and in each case the reproduction value is derived by reducing the utility company's book value by indirect costs that are nonassessable. Plymouth allows the Boston Edison Company (which owns the Pilgrim Station) to make this calculation for the town, while Waterford has retained an appraisal expert to oversee the calculations and prepare an annual report detailing the Millstone assessment. To calculate the depreciation schedule for Millstone, the town of Waterford has agreed to a stabilized rate of 30 percent depreciation over a 16-year period. In essence, this provides the town with a more or less constant tax base over time, in contrast to the declining value that could occur under alternative schedules. At present, there does not appear to be a depreciation schedule for the Pilgrim Station. However, Boston Edison reports approximately one-third of its capital investment as attributable to environmental protection equipment, while in Waterford, this exemption does not figure heavily in the calculation of value. Finally, each town applies the legal assessment ratio to its power station, a rate which is likely higher than that of most other parcels in town. For Plymouth this rate is 50 percent, and in Waterford it is 60 percent.

What all of this means is the although the tax system sets the bounds for calculation of each facility's assessment, the final figure is in large part a negotiated value, with neither side pressing hard to gain advantage. Typically, the utility company does not want to exert excess pressure upon the community to grant tax concessions, because it does not wish objections either to its presence, or to the construction of additional generating units. The towns, on the other hand, do not wish to call unnecessary public attention to their unique tax situations by engaging in court battles that might increase assessments, particularly since in this case both state legislatures have before them pending legislation that would redistribute tax payments from power reactors on a state-wide basis. Moreover, from the point of view of Plymouth and Waterford, the addition of the stations to the tax base was an essentially costless gain; hence, they do not lodge extraneous protests.

### 2.3.4 Difficulties in relating taxable capacity changes to expenditure changes

The major conclusion to be drawn from the discussion thus far is that an increase in taxable capacity permits a community certain latitude in adjusting its tax/service activities. In principle, this process as just described, is relatively straightforward. In practice, however, measuring the actual transactions entered into are much more difficult to distinguish than these simple illustrations imply.

First, the tax base increase occurs incrementally, so that its full weight is not felt at once. Separating the influence of the power station from other influences over time is therefore troublesome. Second, with increasing revenues, various pressures are placed upon budgetary officials that would otherwise not be present. These pressures tend to increase expenditures, but may have only limited influence on service levels. For example, public employees wage increase demands are more easily contained when officials can appeal to public opinion with impending tax rate increases. It may be more difficult to do so when a tax rate increase is not imminent and the size of the rate decrease is at issue. There is pressure as well to enter into capital investments that might otherwise be postponed. When financing public capital expenditures, public officials attempt to minimize the use of long-term debt issuance, preferring to use general revenues. Such expenditure pressures tend to keep the tax rate high, but obscure evaluation of the quantity and quality of public services that might be traced to the power station's influence.

Third, towns such as Plymouth and Waterford do not operate in a vacuum, but are subject to the influence of their respective state governments. Thus, when the state makes mandatory a kindergarten program, as was recently done in Massachusetts, one must take care to avoid erroneously attributing the spending increase to the influences of the station. Also in the case of Plymouth, a number of events combined to bring about a rapid increase in population, among them, outmigration from nearby Boston and the completion of a coastal highway, as well as the presence of a favorable public service/tax payment ratio. Such growth entails the construction of schools, sewers, water lines, and roads, all of which require large expenditures. Once again, the influence of the plant is difficult to partial out.

Finally, in both states a uniform fiscal year is now mandatory. Plymouth made its adjustment in 1973, and, as a consequence, expenditure data consistent with earlier periods are not yet available. Waterford has only recently made this change but, as will be seen below, it created a special fund to stabilize its cash position during the transition period. This practice artificially inflated its tax rate over the past few years.

### 2.3.5 Public and private sector interaction

The fact that the power station brings new purchasing power into the community through the tax base contribution has typically been overlooked in studies of the economic impact of power plant siting. However, the consequences of this purchasing power potentially may overshadow the direct contribution of the facilities to economic activity, usually measured as jobs created.

To recount the private sector influence, each power station hires workers to operate the facilities, and to the extent these workers are domiciled in the host community, they contribute to local economic activity through consumption of housing services, retail goods, and the like. In making these purchases, they stimulate the creation of additional local jobs. Nichols estimates that for every job created directly by the station an additional 0.67 of a job is added through a multiplier effect.[15] This multiplier effect can be enhanced or diminished depending upon whether or not the "propensity to purchase goods locally" of the employees is equal to the average of the rest of the community, and it is truncated to the degree that employees live outside the host community. This does not imply the purchasing power is lost, but simply that its influence on the host community is greatly dilluted.

The public sector influence, as was determined above, consists of an increase to taxable capacity, which in essence means that the community imports tax revenues. To the degree the tax rate is maintained, the impact is felt through the public sector, but when the tax rate is decreased, a portion of the influence is recovered by increasing local disposable income. This process can work to increase local activity much as does the influx of jobs.

For example, suppose that the taxable capacity of a given community were to double and the community responded by halving the tax rate, leaving a local government budget equal to that prior to the siting. In this case, the facility would effectively replace one-half of the tax payments previously made by local citizens and businesses, leaving a significantly larger amount of disposable income for purchasers in the private sector. These purchases could well increase activity in the private sector to a degree greater than that of the additional jobs in the community for which the plant was directly responsible. The community in this instance is said to export a portion of its tax bill. Of course, to the degree tax exporting occurred prior to the introduction of the power reactor, benefits gained in this manner would be similarly exported.

Alternatively, the town could choose to use the increase in taxable capacity to enhance the level of public services provided by the local government by maintaining the existing tax rate and using surplus revenues to purchase additional public goods. If, for example, the power reactor doubled the tax base without appreciably increasing public service needs or costs, the taxpayer would find each dollar from his own pocket matched by an equal contribution from the plant.

It should be emphasized that public expenditures are not neutral in terms of job creation, and, in fact, should stimulate the local economy approximately as much as private expenditures. Increased government expenditures bring additional civil servants, who in turn purchase from the local economy. Thus, while the increase in taxable capacity can potentially influence disposable income in the private sector by permitting a lowered tax rate, the "price" of public services is also halved (assuming a doubling of the tax base), a phenomenon that at least in theory should provide an impetus for additional expenditures.

These "feedback" effects through which the local economy is enhanced are termed multiplier effects and will result from either public or private spending. However, it should be clear, if somewhat paradoxical, that the higher the local tax rate, the greater will be the impact on the local economy, because as the tax rate increases, the quantity of tax dollars "imported" from the power station also increases.

## 2.4 Summary

This economic analysis of local government assumes a local public economy that identifies selected elements in the private sector as its tax base (value, income, etc.), levies a rate of taxation on this base and provides public services with the proceeds of this levy. The relative size of this base is termed the community's taxable capacity, and the act of taxation means fewer dollars will be available to purchase goods and services through the private portion of the local economy.

Unfortunately, for reasons given above as well as the general difficulty in quantifying public sector outputs, it will be difficult to draw conclusions regarding the uses of the additional taxable capacity in the two towns, and even more difficult to pinpoint individual services that have been extended or improved. Thus, before embarking on analysis, it is useful to state an order of priority regarding the issues to be investigated.

Of primary importance to the analysis is the response of the town to the tax base change, in terms of adjustments to the tax rate. Gaining insight to this issue would permit better analysis of probable revenue impacts prior to time of construction, and perhaps a better prior appraisal of the overall impact of the reactor on the local economy. Such information would also permit public utility companies to plan future cash flows more effectively. In addition, a better understanding of town tax behavior could indirectly influence a number of related public policies. For example, if for small towns, tax rates dropped rapidly as the size of the capacity increase took place, utilities might have an additional incentive to locate multiple units within a single town, and one might foresee utility companies lobbying in state capitals against statewide redistribution of power stations' tax bases.

Of equal overall interest, but perhaps less immediate importance, are the particular public benefits that could be traced to the increase in local fiscal capacity. Such impacts reflect the magnitude and distribution of benefits from public sector activities, but are highly dependent upon individual town characteristics and local power structures. Thus, generalizations about them are much more difficult. While we will examine these specific impacts below, it is anticipated that within this area the footing will be much less sound.

# 3. EMPIRICAL ANALYSIS

## 3.1 Taxable Capacity

The magnitude of the influence of the Millstone and Pilgrim Stations can clearly be seen in Table 1, which presents the level of assessed values for each town prior to construction of the power plants, the taxable value recorded for each station, the proportion which the station comprises of total taxable values and the value associated with property other than that of the complex. However, one should avoid direct comparisons of value between towns, since all values are shown in terms of actual assessments. To the degree the average assessment ratios for the two towns differ, the value levels are not comparable.

For each town, the influence of the stations on taxable capacity began in about 1968 and in dollar terms remained about the same through 1973. At this point, a second generating unit at Waterford (scheduled to begin operating in 1975) further increased the tax base. A similar impact will occur in Plymouth if the second Pilgrim unit arrives on the tax roll in approximately five years, as is currently planned.

Perhaps the most important measure of the taxable capacity impact is the percent of the total town property tax base which each plant comprises, shown in columns (3) and (7). In each case, this proportion is so large as to indicate that the traditional tax burden has been significantly altered with the town possessing the option for either major decreases in tax rates or major increases in service levels. At roughly 0.50, as in Plymouth and Waterford, this proportion indicates that expenditure levels could be doubled at a constant tax rate or maintained at one-half the present tax rate. For individual households, this circumstance could mean an impact much greater than the Federal income tax rebate of 1975, and for business, a potentially significant percentage increase on return per dollar of invested capital. Stated differently, the effective impact of the power stations is to match local property tax payments by the ratios shown in columns (3) and (7). That is, in Waterford, the facility pays $.59 out of each local property tax dollar or roughly $1.40 for each dollar that is raised locally. In Plymouth, the impact is slightly less. Here the facility pays about $.46 on the tax dollar or $.85 for each dollar raised.

Table 1

Impact of Millstone and Pilgrim Stations on Assessed Values
in Waterford, Connecticut, and Plymouth, Massachusetts
(in thousands of dollars)

| | Waterford, Connecticut | | | | Plymouth, Massachusetts | | | |
|---|---|---|---|---|---|---|---|---|
| Year | Total Value | Plant Value | Plant Proportion of Total Value | Non-Plant Value | Total Value | Plant Value | Plant Proportion of Total Value | Non-Plant Value |
| 1966* | $ 66,053 | -- | -- | $66,053 | $ 43,451 | -- | -- | $43,451 |
| 1967 | 66,462 | -- | -- | 66,462 | 45,827 | -- | -- | 45,827 |
| 1968 | 72,744 | $ 5,643 | 0.08 | 67,101 | 47,629 | $ 132 | -- | 47,497 |
| 1969 | 90,334 | 20,867 | 0.21 | 67,467 | 51,515 | 1,456 | 0.03 | 50,059 |
| 1970 | 97,983 | 25,846 | 0.26 | 72,137 | 68,751 | 14,510 | 0.21 | 54,241 |
| 1971 | 112,585 | 39,369 | 0.33 | 75,216 | 93,728 | 29,808 | 0.32 | 63,290 |
| 1972 | 130,564 | 51,351 | 0.39 | 79,213 | 114,559 | 44,808 | 0.39 | 69,751 |
| 1973 | 168,456 | 81,728 | 0.49 | 86,728 | 154,429 | 76,442 | 0.49 | 77,987 |
| 1974 | 221,189 | 129,756 | 0.59 | 91,443 | 165,212 | 76,442 | 0.46 | 88,770 |

*Due to differing fiscal years, this column indicates similar but not identical timeframes for each town.

Source: Annual Report: Town of Waterford (various years).
Annual Report: Town of Plymouth (various years).
Additional unpublished data were provided by each town's assessor's office.

It was mentioned above that Plymouth has recently increased in population more rapidly than Waterford; this growth is reflected in its increase in "nonplant" assessments. Between 1969 and 1974, population in Plymouth increased by roughly 36 percent, a rate several times larger than that of Waterford. For this reason, the per capita impact of Pilgrim on taxable capacity has been diluted somewhat, relative to Waterford. Over the period shown, total assessed values per capita tripled in Waterford and more than doubled in Plymouth, but nonplant assessments increased only about 25 percent per capita in each town.

Thus, by almost any standard of measurement, the impact of the power stations on Plymouth and Waterford must be evaluated as extremely significant. In relative terms, however, the impact is somewhat larger in Waterford, due to the influence of the second Millstone unit.

## 3.2 Utilization of Taxable Capacity: Property Tax Rates

Table 2 shows the rate at which assessed value in each town is taxed.

Table 2

Property Tax Rates in Plymouth, Massachusetts and Waterford, Connecticut (in mills)

| Year | Published Tax Rate | |
|---|---|---|
| | Waterford | Plymouth |
| 1966 | 42.0 | 74.4 |
| 1967 | 42.0 | 78.8 |
| 1968 | 42.0 | 92.8 |
| 1969 | 42.0 | 97.2 |
| 1970 | 43.0 | 88.4 |
| 1971 | 43.0 | 79.6 |
| 1972 | 48.0 | 96.0 |
| 1973 | 31.0 | 76.4 |

Source: Annual Report: Town of Waterford (various years).
Annual Report: Town of Plymouth (various years).

The fact that the Plymouth rate is nearly twice that of Waterford, however, should not be interpreted as a valid measure of differential tax burdens, for the reasons discussed above regarding fractional assessment of market value. Most significant in this table is the fact that neither town has maintained its previous level of taxation, even though one might well expect that the average assessment ratio had fallen over time, which suggets an increasing tax rate on assessed value would be necessary to keep the rate at which market value is taxed constant.

Waterford has maintained a relatively constant tax rate over the years shown, but in the final year reduced the tax rate by nearly one-third. However, the rate in Waterford was held at a level higher than that necessary to finance current expenditures for a portion of this period to accumulate funds for financing a change in its fiscal year.

In Plymouth, the rate on assessed value began to decline as early as 1970. The one exception to this pattern, evident in 1972, represented an instance in which the town chose to finance a significant capital item out of current expenditures, a luxury seldom possible for modern local governments.

Table 3 shows the proportion of general revenues that property taxes comprised of total revenues for the two towns, as well as reference statistics for the United States and Massachusetts and Connecticut towns. As the first two columns indicate, the property tax has been a declining source of revenue nationally, but has been stable for Connecticut towns and has actually increased for Massachusetts towns.

Waterford generally follows the Connecticut pattern, with a slight decline in the proportion of revenues supplied by the property tax over the five-year period shown. This was due to an increase in revenues obtained from other local tax sources that exceeded growth in property tax revenues. The yield from the property tax grew by 106 percent, while overall revenues grew by 110 percent. For all towns in Connecticut, total revenue grew by an average 95 percent.

Plymouth, in contrast, experienced a rapid increase in the share of local revenues accounted for by property taxes. This tendency generally mirrors that of other towns in the state, but nonetheless is much more

Table 3

Property Taxes as a Proportion of Local General Revenue
in Plymouth, Massachusetts and Waterford, Connecticut

| Year | All U.S. Local Governments | All U.S. Municipalities | Massachusetts Townships | Connecticut Townships | Waterford | Plymouth |
|---|---|---|---|---|---|---|
| 1966-7 | 0.43 | 0.38 | 0.67 | 0.71 | 0.70 | 0.52 |
| 1967-8 | 0.42 | ---- | ---- | ---- | 0.68 | 0.51 |
| 1968-9 | 0.41 | ---- | ---- | ---- | 0.69 | 0.56 |
| 1969-0 | 0.40 | 0.34 | ---- | ---- | 0.66 | 0.66 |
| 1970-1 | 0.39 | 0.32 | ---- | ---- | 0.70 | 0.69 |
| 1971-2 | 0.39 | 0.31 | 0.75 | 0.71 | 0.68 | 0.73 |

Source: Columns 1-2, 1972 Census of Governments, Vol. 6, No. 4.
Columns 3-4, 1967, 1972 Census of Governments, Vol. 4, No. 5.
Columns 5-6, Annual Report: Town of Waterford (various years).
Annual Report: Town of Plymouth (various years).

pronounced. In Plymouth, prorerty tax revenues grew by more than 200 percent over the five-year period, while total revenues increased by only 118 percent, resulting in a much decreased share for nonproperty tax sources. During this same time, property tax receipts for all towns in the state increased by 94 percent and total revenues by 73 percent.

More striking than the overall scope of activities in each town, however is the change relative to population growth. Plymouth increased in population significantly over the period, while Waterford remained nearly stable. The rapid revenue growth in Plymouth must be tempered by the fact that on a per capita basis revenues increased by only 74 percent, but in Waterford, they increased by 98 percent. This finding highlights the fact that a major influence on the part of the power stations was to present each town with a much more varied set of options than those found in the typical governmental jurisdiction. It is, moreover, somewhat surprising to find a basically similar response in terms of property tax rate changes, in view of the revenue comparisons.

Perhaps the most useful predictive statistic for analyzing the fiscal impact of siting a power reactor would be the tax rate elasticity relative to the plant proportion of the tax base. This would indicate, for example, that if a power station increased the property tax base by a given percentage the tax rate would change by a correspondent percent. In fact, so many additional variables influence tax rate levels that it would be quite difficult to estimate such a statistic accurately and with confidence, particularly if it was to have applicability to other jurisdictions. Among the intervening variables of greatest importance is the assessment ratio, which is used to define the rate of taxation on market value. Moreover, the elasticity of greatest usefulness would measure not marginal changes but very large ones, a significant departure from the common definition of an elasticity. Thus, undertaking a thorough analysis of the problem is beyond the scope of this analysis. Nonetheless, because of its potential usefulness, some rough calculations will be made in an attempt to place a broad bound on the range this statistic might take, based on the behavior evident in Waterford and Plymouth.

To calculate this statistic, defined as the ratio of percentage change in the tax rate to the percentage change in the contribution of the plant

to taxable capacity, one first divides the assessed values not associated with the station into the total assessments, arriving at a "price." This price indicates the total revenue yield from a dollar of locally raised revenues. It is equal to unity when a zero value is entered for the station and increases as the station's value increases. The crude elasticity is then estimated by dividing the percentage change in the tax rate by the percentage change in the price ratio. When these calculations were carried out for Plymouth and Waterford, individual years show little or no pattern, particularly for Waterford which retained a constant tax rate over a large part of the period under study. When the calculations are carried out for the period spanning the life of each plant through 1973, however, the values generated were reasonably consistent. For Waterford the calculated elasticity was -.27 and for Plymouth it was -.18. If interpreted literally, these elasticities would indicate that for each percent increase in the defined price ratio, the rate of taxation would decline by .27 percent in Waterford and .18 in Plymouth. In practical terms they suggest that tax rates may be expected to fall over a period of years as the effects of the massive tax base increase become cumulative, but that the change in the base greatly exceeds the change in the rate. In other words, the localities under consideration showed no inclination to maintain a constant level of expenditure with a greatly reduced tax rate. From this evidence, it also appears that the expected assessed value of the power station multiplied times the tax rate prior to construction probably will overstate the tax revenues associated with the siting.

### 3.3 Expenditure Patterns

In view of the significant differences in population growth experienced by Plymouth and Waterford, and the pattern shared by each of operating within a more narrow range of tax rate options than are in fact available, one might expect substantial differences in the division of local budgets among possible service alternatives. To address this issue, local government services are divided into two categories — education and other expenditures — keying on the fact that providing elementary and secondary education remains the principal activity of most localities. Moreover, because population change is

relatively age-specific, with families that migrate commonly falling within age groups containing school-aged children, one can predict a priori that educational expenditures would play a key role in shaping the expenditure behavior of the two towns under examination. Indeed, analysis bears out this expectation.

For 1967, educational expenditures made up 63 percent of the local budget in Waterford, but only 35 percent in Plymouth. Over the five-year period to 1972, education's share of the Waterford expenditure package fell to 55 percent, while in Plymouth it increased to 43 percent. Nonetheless, in per capita terms, the rates of increase were nearly identical, with each rounding to 72 percent. This finding reflects not only educational outlays in Plymouth, but the extremely low level of per capita noneducational expenditure in Waterford that existed in 1967 and that increased by 240 percent over the period. This contrasts with 25 percent increase in per capita noneducational expenditures in Plymouth over this same period.

One determinant, and perhaps the prime determinant, of these expenditure differences lies in the number of students in each town during these two periods. As illustrated in Table 4, school enrollments more than doubled in Plymouth over the eight-year period following 1967. In sharp contrast, Waterford enrollments scored an absolute decline over this same period.

For Plymouth, the cause of this increase was two-fold, stemming from not only the rapid growth in population, but also the introduction of a state mandated kindergarten program. In Waterford, with a basically stable population, students apparently aged out of elementary and secondary age groups more rapidly than they were replaced. This phenomenon is shown most clearly in the enrollment ratio of each town, the ratio of students to total population. Between 1967 and 1975, this ratio declined in Waterford from 0.27 to 0.23, while in Plymouth it increased from 0.18 to 0.27. For this reason, educational expenditure per student, rather than per capita, better explains the impact of expenditure changes on the relevant service recipient group. By this measure, Waterford saw an 87 percent gain in expenditures between 1967 and 1972, relative to Plymouth's gain of 50 percent. Were data available for the last three years, in which major changes in the enrollment ratios continued, an acceleration of this trend would likely be visible.

Table 4

Population School Enrollments and Education Expenditures
in Waterford, Connecticut and Plymouth, Massachusetts

| | Waterford, Connecticut | | | | | Plymouth, Massachusetts | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | Population | School Enrollment | Enrollment Ratio | Per Capita Expenditure | Per Student Expenditure | Population | School Enrollment | Enrollment Ratio | Per Capita Expenditure | Per Student Expenditure |
| 1967 | 16,495 | 4,433 | .27 | 148 | 550 | 16,060 | 2,948 | .18 | 142 | 776 |
| 1968 | 16,679 | 4,518 | .27 | 165 | 607 | 16,696 | 3,225 | .19 | 153 | 794 |
| 1969 | 16,863 | 4,574 | .27 | 180 | 664 | 17,332 | 3,386 | .20 | 173 | 886 |
| 1970 | 17,047 | 4,524 | .27 | 206 | 776 | 17,968 | 3,743 | .20 | 196 | 940 |
| 1971 | 17,227 | 4,441 | .26 | 230 | 892 | 18,606 | 3,843 | .21 | 217 | 1,048 |
| 1972 | 17,507 | 4,359 | .25 | 255 | 1,026 | 20,265 | 4,253 | .21 | 244 | 1,164 |
| 1973 | 17,787 | 4,251 | .24 | 273 | 1,143 | 21,924 | 4,709 | .22 | * | * |
| 1974 | 18,067 | 4,314 | .24 | 291 | 1,219 | 23,584 | 5,980 | .25 | * | * |
| 1975 | 18,348 | 4,159 | .23 | * | * | 25,242 | 6,728 | .27 | * | * |

*Due to changes in the fiscal accounting period used by each town, these values were not wholly comparable and were excluded.

Source: Annual Report: Town of Waterford (various years).
Annual Report: Town of Plymouth (various years).

Note: Population figures are taken from the Census of Population, 1960-1970 and from estimates by the Federal State Cooperative Program for Population Estimates (1974). Values for intermediate years were calculated by linear interpolation.

Turning to noneducational expenditures, it is quickly evident that close comparison of expenditure levels can be misleading. As is illustrated in Table 5, the major difference between noneducational expenditure levels is buried in an "all other" category, and primarily manifest through a rather high entry for Plymouth. Most of the difference between the towns for this column originates in state supported activities where the locality acts on behalf of the state, and in general, these expenditures are compensated through state aid programs. For example, one large component of this class is veterans benefits, and a second is pensions and retirement, neither of which greatly affects local budgets in Connecticut. For this reason, this activity is grouped together, and for most purposes can be ignored.

A second reason for differences in expenditure totals is similar to that discussed with respect to education: put simply, the workload, or group served, can be different in size or kind. Unfortunately, once one moves out of the education area, where numbers of students establish workloads reasonably well, it is difficult to factor accurate comparisons into the analysis. Plymouth, for example, experiences a large influx of population during the summer months, from owners of second homes, renters of summer cottages, or simply from tourists. The degree to which this consideration causes Plymouth to outspend Waterford in areas of public safety or public works is not easily documented, and perhaps not really important for this purpose. More importantly, we will attempt to note instances of rapid change and departure from past patterns.

Moving from left to right across Table 5 one finds Waterford and Plymouth devoting approximately equal per capita amounts on general administrative services. Plymouth outspends Waterford in areas of public works (roads, sewers, etc.) and public safety (police and fire); however, in each case, the Waterford rate of increase exceeds that of Plymouth. Debt service and capital outlay areas provide the towns with an opportunity to spend potential revenue increases, and Plymouth has not issued a long-term bond since the siting of the Pilgrim station, preferring to cover all capital outlays through the current budget. Waterford generally also follows this pattern, but has recently issued bonds to finance a major reworking of its sewer system.

Table 5

Noneducational Expenditures Per Capita
Plymouth, Massachusetts and Waterford, Connecticut
(Per Capita Dollars)

| Year | Total | | General Control | | Public Works | | Public Safety | | Debt Service and Capital Outlay | | All Other | | Waterford Revenue Account |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Plymouth | Waterford | Plymouth | Waterford | Plymouth | Waterford | Plymouth | Waterford | Plymouth | Waterford | Plymouth | Waterford | |
| 1967 | $262 | $ 88 | $12 | $11 | $41 | $13 | $39 | $10 | $ 35 | $40 | $133 | $12 | $ 0 |
| 1968 | 425 | 104 | 13 | 11 | 43 | 14 | 44 | 12 | 208 | 37 | 115 | 27 | 0 |
| 1969 | 278 | 143 | 13 | 16 | 48 | 16 | 48 | 15 | 97 | 40 | 69 | 21 | 33 |
| 1970 | 286 | 159 | 16 | 19 | 53 | 26 | 56 | 19 | 81 | 61 | 77 | 15 | 16 |
| 1971 | 305 | 171 | 16 | 25 | 56 | 32 | 64 | 23 | 88 | 55 | 78 | 17 | 17 |
| 1972 | 327 | 380 | 19 | 22 | 59 | 32 | 63 | 26 | 109 | 78 | 77 | 19 | 34 |

Source: Annual Report: Town of Waterford (various years).
Annual Report: Town of Plymouth (various years).

Still, it should be noted that capital outlays do not occur evenly over time and are not always associated with such major variation in tax rates as was observed above in Plymouth. In many instances, opportunities to accept matching grants become available from modest rate adjustments, but nonetheless adjustments which might be avoided were a large tax base not present. Connecticut, for example, has a matching fund for the construction of school buildings which now appears in some danger of being reduced, and this contingency has sparked local discussion of replacing a currently viable building, rather than risk being frozen out at some future date. It is unlikely that towns in a less firm fiscal position could seriously consider such an outlay.

The final column in this table shows revenues Waterford accrued in an account to provide for a transition to a uniform fiscal year. Although this fund no longer exists, it appears to have acted as a balancing item which led to a stabilized tax rate over the period when Plymouth experienced tax rate reductions. Since this account has now been closed, and local governments are precluded by law from operating at a surplus over a period of time, the Waterford tax rate may well continue to decline unless maintained to finance capital outlays. This is a strong possiblity, particularly in view of the recent decision to conduct extensive sewer construction.

While this recounting of expenditure patterns cannot firmly establish the distribution of benefits accruing to the increases in taxable capacity experienced by Plymouth and Waterford, and in fact points to the danger in examining expenditure changes apart from such basic elements as population change, it has highlighted the flexibility with which each town has been able to approach public service budgeting. Clearly, tax rate increases that have occurred can be very easily tied to service increases, capital purchases, or in Waterford's case to the provision of funding for a transition period during which many similar towns found it necessary to issue debt. Moreover, even with declining tax rates, expansion of expenditures across a broad spectrum is evident. The degree to which these changes reflect better or additional public services, unfortunately, cannot be accurately factored out within the present framework, and, beyond an examination of enrollment changes, no attempt has been made to do so. Nonetheless,

it would seem that neither town has been or is likely in the near future to become subject to the pressures of a "taxpayers rebellion," nor are serious objections to existing service levels likely to be raised.

## 3.4 Comparing Public and Private Sector Impacts

### 3.4.1 Overview

What now remains is to contrast the findings of the previous portion of the section regarding the magnitude of the fiscal impacts with the impacts on the private portions of the Plymouth and Waterford economies. Unlike the examination of expenditures above, this discussion will not deal with the distributional aspects of the private sector impact. Rather, the aim will be to demonstrate that the economic influence of the Pilgrim and Millstone stations, under the general conditions discussed above, may be most substantial when viewed through the public sector, rather than the private sector.

To estimate the magnitude of public and private sector additions to local income, one can simply multiply the tax rate times the assessed value of the station and the number of employees times the average wage rate. Were we interested in the multiplier effects, it would be necessary to adjust these columns further by changes in local disposable income resulting from modifications to the tax rate, but in the absence of reasonable estimates of these parameters, the simplest analytical framework will be followed. Thus, rather than engaging in a detailed analysis of the full range of impacts on the local economy, this discussion should be viewed as a crude first look at aggregate local economic impacts of the operating stations.

The results of carrying out the above calculations are presented in Table 6. Because of variance in the wage bill due to construction workers, reasonable estimates of numbers of operating workers and their wage payments have been inserted, with the disclaimer that those wishing to modify these values can easily do so and repeat the calculation. As regards the public sector, values from the latest years available have been employed (see previous tables). The estimates presented in Table 6 are therefore a synthetic representation of the economic impact of each station.

Table 6

Approximate Public and Private Sector Direct Economic Impacts In Plymouth, Massachusetts and Waterford, Connecticut, 1974

| | Millstone | Pilgrim |
|---|---|---|
| Workers | 90 | 90 |
| Salary | $13,000 | $13,000 |
| Wage bill | $1,117,000 | $1,117,000 |
| Assessed value of station in 1974 | $129,756,000 | $76,442,000 |
| Tax rate in 1974 | .031 | .076 |
| Tax payment | $4,022,000 | $5,810,002 |
| Total direct impact | $5,139,000 | $6,927,000 |
| Percent tax | .78 | .84 |
| Per capita direct impact | $284 | $294 |

Source: Fiscal information, Annual Report, Town of Waterford and Annual Report, Town of Plymouth. Worker information is estimated.

Because of the employee assumptions chosen, each town is shown with an identical wage bill of $1.1 million. Pilgrim, by these calculations makes somewhat larger tax payments than Millstone, but more importantly, in each case the tax payment far exceeds the wage bill. In Plymouth, the tax payment comprises 84 percent of the total dollar impact of the station, and in Waterford, 78 percent of the total. These amounts represent additions to income of roughly $300 per capita in each town.

What this means is that any analysis of reactor siting that presumes to estimate economic impacts must consider the fiscal impact if it is even to approximate the influence of the siting. Failing this, the economic impact of the station cannot be ascertained.

# 4. SUMMARY AND CONCLUSIONS

The discussion and conclusions contained in this paper have emphasized the complexity of public sector analysis with the purpose of indicating the limitations imposed by the existing data. The conclusions drawn above have thus been qualified, but even in this rough state, point strongly to the existence of substantial fiscal impacts that may be associated with reactor siting, under conditions of local property taxation.

It is concluded that significant increases in taxable capacity accompanied the siting of the Millstone and Pilgrim power stations and that this impact has greatly enriched the public sectors of Plymouth, Massachusetts and Waterford, Connecticut. The towns, in turn, responded by slightly lowering tax rates, but more generally, by broadly expanding public services. The distribution of public service benefits appeared to hinge on educational considerations, with numbers of students the prime determinant. In addition, each town has expanded services in noneducational areas; Waterford increased services in a fairly uniform manner, but Plymouth responded primarily to the pressures of a rapidly growing population. Particularly evident is the tendency of the towns to purchase capital items through operating budgets, rather than debt budgets, although this phenomenon is particularly difficult to quantify.

The total economic influence of the station was not analyzed, owing to the unavailability of information regarding public sector multiplier effects, but a rough estimate of direct public and private sector economic impacts was carried out. This exercise indicated that a significantly larger direct impact was evident through the public sector than through the private sector, but that the two were closely tied. In general, the towns appear to have received a substantial economic impact. Using commonly accepted measures of well being, it would be difficult to argue the towns are not economically better off following the sitings than before.

In reaching this final conclusion, it should be clearly understood that the analysis presented above in no way attempted to measure noneconomic costs associated with the sitings and made little headway in ascertaining redistribution of income among competing groups. Quite possibly, if such

analyses were carried out the conclusion would be even more qualified, and perhaps more subject to individual interpretation. Moreover, the present attempt ignores any consideration of national issues regarding the use of nuclear power as an energy source and would not have differed greatly had the item of concern been more mundane, say perhaps an industrial park. Rather, the modest attempt was to address, and hopefully clarify, a number of issues regarding the economic impacts exerted upon host communities as a result of siting a specific facility.

## 4.1 Suggestions for Further Research

The length of discussion preceding the empirical portion of the paper, and the severe qualifications through which the conclusions were offered, suggests that further analysis remains to be done regarding impact analysis in general, and reactor siting in particular. The following items, in no particular order, reflect the author's conclusions regarding the need for further analysis.

(1) The establishment of the basis for taxation of public utility property is most complex and particularly so for a nuclear reactor. Guidelines dealing with assessment techniques, environmental exemptions, depreciation and changes in these variables over time should be prepared by a group with particular expertise in property appraisal.

(2) Although the evidence presented above suggests that tax rates may fall somewhat in response to massive increases in taxable value, this process is neither well-documented nor well-understood. Further research should investigate the tax rate-tax base elasticity to permit better estimates of the fiscal impact on communities and better estimates of tax liabilities for utility companies.

(3) Perhaps the most important aspect of impact analysis is the capability of identifying individual groups, who stand to gain or lose as a result of a siting. Further research into this topic including service expansion, tax redution, and changes in economic activity should be carried out.

(4) Although it was not addressed above, changes in tax/service packages imply changes in land values, particularly with respect to values in neighboring communities. This impact contains significant implications for redistribution of wealth and income and also community development, but remains largely unexamined with respect to reactor siting.

(5) This analysis recognized the existence of income multipliers associated with job creation, service expansion and tax reduction, but did not pursue them. Further analysis is necessary to ascertain the total economic impact associated with reactor siting.

(6) The findings of this analysis shed little empirical light on the matter of whether or not reduced tax rates provide significant incentives for immigration, although economic analysis would suggest this is the case. Additional research should be directed toward examining whether this incentive is likely to exist in towns suitable for siting power reactors.

(7) Finally, there exists a host of institutional considerations not addressed above that surround the more general issues of state and national policy toward nuclear power. Should states redistribute tax bases associated with nuclear generation facilities located in small communities? What form should compensation take when public utility corporations not subject to taxation are involved? What significance does the export of electricity across state lines imply? While there exist a number of precedents concerning these topics for many states, they remain largely unresolved, for example, in Connecticut and Massachusetts. Additional analysis providing a factual foundation for these discussions should be conducted.

## REFERENCES


1. See Thomas Muller, *Fiscal Impacts of Land Development* (Washington, D.C., The Urban Institute).

2. Eric J. Stenehjem, *Forecasting the Local Economic Impacts of Energy Resource Development: A Methodological Approach*, Argonne National Laboratory, December 1975.

3. See E. Peelle, B. Purdy, D. Bjornstad, R. C. DeVault, and T. J. Mattingly, Jr., *Post Licensing Case Study of Community Effects at Two Operating Nuclear Power Plants*, Oak Ridge National Laboratory (in preparation).

4. Ibid.

5. Strictly speaking, this generalization holds true only for investor-owned utilities, since government-owned ones are not liable for taxes. This latter group, however, usually makes payments to local governments in lieu of taxes.

6. Certain public interest groups have tended to discount these advantages. Cf., Harbridge House, *The Social and Economic Impact of Nuclear Power Plant upon Montague, Massachusetts, and the Surrounding Area*, (Boston, 1974), p. ii, where Ralph Nader is quoted as having dismissed the "property tax impact" as "overrated and misleading."

7. James C. Nichols, *The Socio-Economic Impact of the Florida Power and Light Company Martin Plant Upon Martin County*, mimeograph, undated, Section 4.0.

8. John S. Williams, Jr., and Stephen Spigel, *Socio-Economic Impact of Estuarine Thermal Pollution* (MetroStudy Corporation: Washington, D.C., 1974), p. 64.

9. The impact of a reevaluation is discussed further in Section 2.3.2.

10. Harbridge House, op. cit., Appendix II-E.

11. Ibid, p. III-10.

12. Economic theory suggests that what actually occurs when such an increase takes place is a change in the relative price of public and private sector goods with the outcome that if the tax base doubles, the taxpayer can achieve two dollars of spending from a one dollar outlay on his part. Under this circumstance, it is probable that the community will choose a higher level of public service than previously existed, but a lower amount than would have existed under a constant tax rate.

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13. In fact, the assessor has an incentive not to incorporate total changes into the assessments, but only to make marginal modifications that serve to maintain equity among parcels. Larger changes would be constantly challenged, thus requiring much more effort, and are really not necessary since manipulating the tax rate levied on assessed value achieves the idential result.

14. U.S. Bureau of the Census, Census of Governments, 1972, Vol. 2, Part 2, p. 11.

15. James C. Nichols, op. cit., Section 1.0.