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Since 1970 there has been a distinct movement of people and economic activity from the northeast and north-central regions to the southeast and southwest--sometimes referred to as the Sunbelt--and to the Rocky Mountain area. Such population and industry shifts alter the energy requirements of the regions affected. Findings/Conclusions: To be dealt with effectively, the energy implications associated with disparate regional growth require detailed analysis. The nature and magnitude of related energy problems can be defined, and the potential significance of energy-saving strategies can be assessed. However, the Federal, State, and private sectors have not fully assessed the energy implications of regional population and industry shifts. Coordinated efforts are required by the three sectors to: develop State-level forecasts of energy consumption which accurately reflect the differences in regional and State growth patterns, analyze the energy implications of population shifts and develop plans and strategies for managing affected areas, and implement plans for dealing with energy implications in existing and future programs. Recommendations: The Secretary of Energy should: identify and continuously assess the nature and extent of national and regional energy implications of population and economic shifts; consider the energy implications in carrying out existing and future programs designed to assist States in dealing with their energy problems; and revamp petroleum allocation procedures to give timely consideration to shifting energy demand to ensure that, during severe energy shortages, all regions and States receive an equitable share of available supplies. He should also encourage each State to take the initiative to: assess the energy implications of population and industry shifts, monitor the expansion of the energy distribution system within each State, and implement effective mechanisms for encouraging the use of conservation methods.

(RRS)

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REPORT BY THE U.S.

# General Accounting Office

## Better Planning Needed to Deal with Shifting Regional Energy Demand

Recent shifts in population, industry, and energy demand among the regions of the Nation have intensified energy problems in some areas and created enhanced opportunities to conserve energy. Detailed analyses and careful planning are needed so that actions can be taken to ease these problems and take advantage of the special opportunities to conserve energy created by the shifts.

This report reviews Federal, State, and private efforts to assess and plan for the energy implications associated with population shifts and identifies areas where better planning is needed.



FEBRUARY 22, 1978

EMD-78-35



UNITED STATES GENERAL ACCOUNTING OFFICE  
WASHINGTON, D.C. 20548

ENERGY AND MINERALS  
DIVISION

B-178205

The Honorable  
The Secretary of Energy

Dear Mr. Secretary:

This report provides information on how regional shifts in population impact on energy use and is intended to assist you in dealing with these impacts when developing future energy programs and implementing existing programs.

We wish to call to your attention our recommendations on page 24. As you know, section 236 of the Legislative Reorganization Act of 1970 requires the head of a Federal agency to submit a written statement on actions taken on our recommendations to the Senate Committee on Governmental Affairs and the House Committee on Government Operations not later than 60 days after the date of the report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

Copies of this report are being sent to the Director, Office of Management and Budget; the Chairmen, House Committees on Appropriations and Government Operations and to the Senate Committee on Governmental Affairs; and oversight committees for the Department of Energy.

Sincerely yours,

A handwritten signature in cursive script that reads "Monte Canfield, Jr.".

Monte Canfield, Jr.  
Director

D I G E S T

Energy is a critical national problem today and for the foreseeable future. The difficulty of finding equitable solutions to the Nation's energy problems has been compounded recently by changes in regional growth patterns. Since 1970 there has been a distinct movement of people and economic activity from the northeast and north-central regions to the southeast and southwest--sometimes referred to as the Sunbelt--and the Rocky Mountain regions.

Between 1970 and 1975 the population growth rates in the Sunbelt and Rocky Mountain regions were at least 12 times greater than in the northeast region and at least 5 times greater than in the north-central region. During the same period, nonagricultural employment increased 19 percent in the rapidly growing regions while increasing less than 2 percent in the northeast and north-central regions. (See p. 1.)

Among other things, population and industry shifts alter the energy requirements of regions affected. Energy consumption in the growing Sunbelt and Rocky Mountain regions increased 12 percent between 1970 and 1975 while the national average increased by only 5 percent. During the same period energy consumption in the northeast region actually declined about 8 percent. (See p. 7.)

Several energy implications are associated with disparate regional growth patterns. Energy shifts can cause special energy related problems and, on the other hand, create enhanced opportunities to better use our energy resources. This report identifies these energy implications and discusses the Federal, State, and private sector efforts to assess and deal with them. (See p. 5.)

PLANNING FOR THE ENERGY  
IMPLICATIONS OF POPULATION  
AND INDUSTRY SHIFTS

Planning is a key management function which provides the means for coping with complex problems within an ever-changing environment. Through such planning, the energy implications associated with population and industry shifts can be assessed and Federal, State, and private sector efforts affecting energy can be managed rationally and effectively.

Associated with the disparate regional energy growth patterns are several energy implications. For instance, in rapidly growing regions, there may be a need to expand energy distribution systems as energy demand increases. Conversely, in regions with declining or slowly growing energy demand, there is a need to ensure that energy distribution systems are not needlessly expanded. (See pp. 7 and 9.)

Another implication of the shifting regional energy demand is the potential misallocation of controlled energy resources among the regions during energy crises. To ensure an equitable distribution of available energy supplies during shortages, Government allocation procedures should be structured to (1) carefully assess any shifts in energy demand occurring since the established base period and (2) make timely adjustment of supply allocations where justified.

Yet another and more positive implication of the shifts in growing regions is the enhanced opportunity for using modern conservation and renewable energy resource technologies as new factories, businesses, homes, and even entire communities are constructed. Generally, it is cheaper and more effective to "build in" conservation techniques and devices which use more abundant or renewable energy resources than to retrofit existing structures. (See p. 9.)

To be dealt with effectively, the energy implications associated with disparate regional growth requires detailed analysis. The nature and magnitude of the related energy problems and potential problems can be defined and the potential significance of the energy-saving opportunities can be assessed. Within this framework, plans can then be developed and actions taken to alleviate the problems and to capitalize on opportunities for adopting conservation techniques and using renewable resources.

With adequate analysis and by working together, the Federal, State, and private sectors can assess the energy implications of population and industry shifts. Such assessments should help them in formulating their efforts to ensure that:

- Regional electrical generating capacity and energy distribution systems expand or contract as regional energy requirements change.
- All States and regions receive an equitable share of available energy supplies during energy crises.
- Modern conservation methods, more abundant energy sources, and renewable energy resource technologies are used to the maximum extent practical as new structures are built.
- State and regional growth strategies are developed which adequately consider the energy impacts of economic growth and stagnation. (See pp. 11 and 12.)

**BETTER ENERGY PLANNING  
AND COORDINATION NEEDED**

In visiting the primary energy agencies in the Federal Government and in eight States and private energy companies, GAO found that the Federal, State, and private sectors have not fully assessed the energy implications of regional population and industry shifts. Although many studies had been completed on energy topics which, to some extent, relate

to the implications of regional shifts, comprehensive analyses were generally lacking. In addition, long-range energy consumption forecasts on a State-by-State basis were not available at the Federal level.

In reviewing the Federal response, GAO focused on the efforts of the Federal Energy Administration and the Energy Research and Development Administration. On October 1, 1977, both agencies became part of the Department of Energy. Neither the Federal Energy Administration nor the Energy Research and Development Administration had made a study of the energy implications of population and industry shifts, with analysis of past and projected demographic and energy statistics on a regional and State-level basis. Both agencies made national forecasts of energy supply and demand and the Federal Energy Administration made regional forecasts. However, neither agency published long-range energy consumption projections on a State-by-State basis. (See p. 14.)

GAO also found that the Federal Energy Administration and the Energy Research Administration each had several programs which indirectly addressed some of the energy impacts of disparate regional growth. For example, the Federal Energy Administration initiated the State Energy Conservation Program which is intended to assist the States in establishing and implementing energy conservation plans designed to reduce projected State energy consumption by 5 percent by 1980. The Energy Research and Development Administration initiated the Energy Extension Service which will encourage small energy consumers to adopt techniques that save energy and technologies that use renewable energy resources. This program is currently being implemented on a pilot basis. (See p. 15.)

Both of these programs and others could contribute to resolving the Nation's energy problems. GAO believes, however, that existing and future energy programs should give greater consideration to the specific

regional and State energy implications created by shifts in population and economic activity.

No State visited had programs aimed specifically at the energy implications of population and industry shifts. However, each State had initiated or at least had plans to initiate measures which, to varying degrees, addressed some of the energy problems and opportunities associated with disparate regional growth. Few of the States visited had considered energy issues within an overall framework of State growth planning and analysis. Except for new electrical generating capacity, most States visited did not closely monitor the private sector's plans for expanding the energy distribution systems to ensure that expansion parallels expected growth. Officials in two of these States said the expansion of natural gas, petroleum products, and coal distribution networks was a private sector prerogative and not a responsibility of the State government. (See p. 17.)

In reviewing the private sector, GAO found no major studies which comprehensively analyzed the energy implications of population and industry shifts. The analysis of energy effects of unbalanced regional growth appears to be generally lacking in the private sector. (See p. 20.)

### CONCLUSIONS

Since 1970 dramatic shifts in population and economic activity have occurred among the regions of our Nation. Accompanying these shifts are energy implications. For this reason, detailed analyses and careful planning are needed to prevent energy problems and help maximize the enhanced conservation opportunities in rapidly growing regions.

The Federal, State, and private sectors have made progress toward assessing the energy implications and considering such implications in their plans and programs. We believe, however, that such assessments



and plans can be greatly improved. Many studies have been completed on energy topics which to some extent consider the implications of regional shifts. The Federal Government has also consolidated its energy efforts in the Department of Energy, which should aid in establishing uniform requirements for States to develop and implement energy conservation measures. Comprehensive analyses are generally lacking, however, and long-range energy consumption forecasts on a State-by-State basis have not been available at the Federal level. (See p. 22.)

Two of the States we visited considered energy issues within an overall framework of State growth planning and analysis. Although most States monitor expansion in electrical generating capacity, most States did not monitor expansions of other energy distribution systems to ensure that expansion parallels the expected growth.

To effectively deal with the energy implications of population and industry shifts will require coordination of efforts by the Federal, State, and private sectors to:

- Develop State-level forecasts of energy consumption which accurately reflect the differences in regional and State growth patterns.
- Analyze the energy implications of the shifts and develop plans and alternative strategies for dealing with them.
- Implement plans and strategies for dealing with the energy implications in existing and future programs.

Such coordinated efforts should help the Federal, State, and private sectors focus their programs on the potential energy problems, and, perhaps more important, on the opportunities resulting from population and industry shifts. (See p. 23.)

To achieve the goals of energy programs in the shortest possible time, it is essential that the energy implications of population

and industry shifts be adequately considered in developing program plans and procedures. Such consideration should help the Department ensure that its programs address potential regional problems and opportunities and are responsive to the regional energy needs of the Nation. (See p. 23.)

### RECOMMENDATIONS

GAO recommends that the Secretary of Energy:

- Identify and continuously assess the nature and extent of national and regional energy implications of population and economic shifts. This should include the preparation of detailed, long-range forecasts of energy consumption on State-by-State basis.
- Consider the energy implications of population and industry shifts in carrying out existing and future programs designed to assist the States in dealing with their energy problems.
- Revamp petroleum allocation procedures to give timely consideration to shifting regional energy demand to ensure that, during severe energy shortages, all regions and States receive an equitable share of available energy supplies.
- Encourage each State to take the initiative to (1) assess the energy implications of population and industry shifts to and from their respective States, (2) monitor the expansion of the energy distribution systems within each State to ensure that such expansions are consistent with the expected growth in energy demand, and (3) implement effective mechanisms for encouraging the use of conservation methods, more abundant alternative fuels, and renewable resources in new construction. (See p. 24.)

### AGENCY VIEWS

The Department of Energy officials basically agreed with GAO's recommendations and have initiated actions to implement them. (See p. 24.)

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**ABBREVIATIONS**

<b>ERDA</b>	<b>Energy Research and Development Administration</b>
<b>FEA</b>	<b>Federal Energy Administration</b>
<b>GAO</b>	<b>General Accounting Office</b>

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## CHAPTER 1

### INTRODUCTION

Finding sufficient supplies of energy to meet the Nation's energy demand is a critical problem today and for the foreseeable future. The Nation's energy problems have been caused by an ever-increasing demand for energy coupled with diminishing energy supplies. Unless our country makes a timely adjustment from past energy trends, the Nation's defense, its economic security, and the American way of life could be gravely endangered. The difficulty of finding equitable solutions to the Nation's energy problems has been compounded in recent years by significant changes in regional growth patterns.

### REGIONAL SHIFTS IN POPULATION AND ECONOMIC ACTIVITY

Since 1970 there has been a distinct movement of people and economic activity from the northeast and north-central regions to the southeast and southwest--sometimes referred to as the Sunbelt--and the Rocky Mountain regions. (See map on page 2.) Between 1970 and 1975 the population growth rates in the Sunbelt and Rocky Mountain regions were at least 12 times greater than in the northeast region and at least 5 times greater than in the north-central region. During the same period, nonagricultural employment increased 19 percent in the rapidly growing regions while increasing less than 2 percent in the northeast and north-central regions.

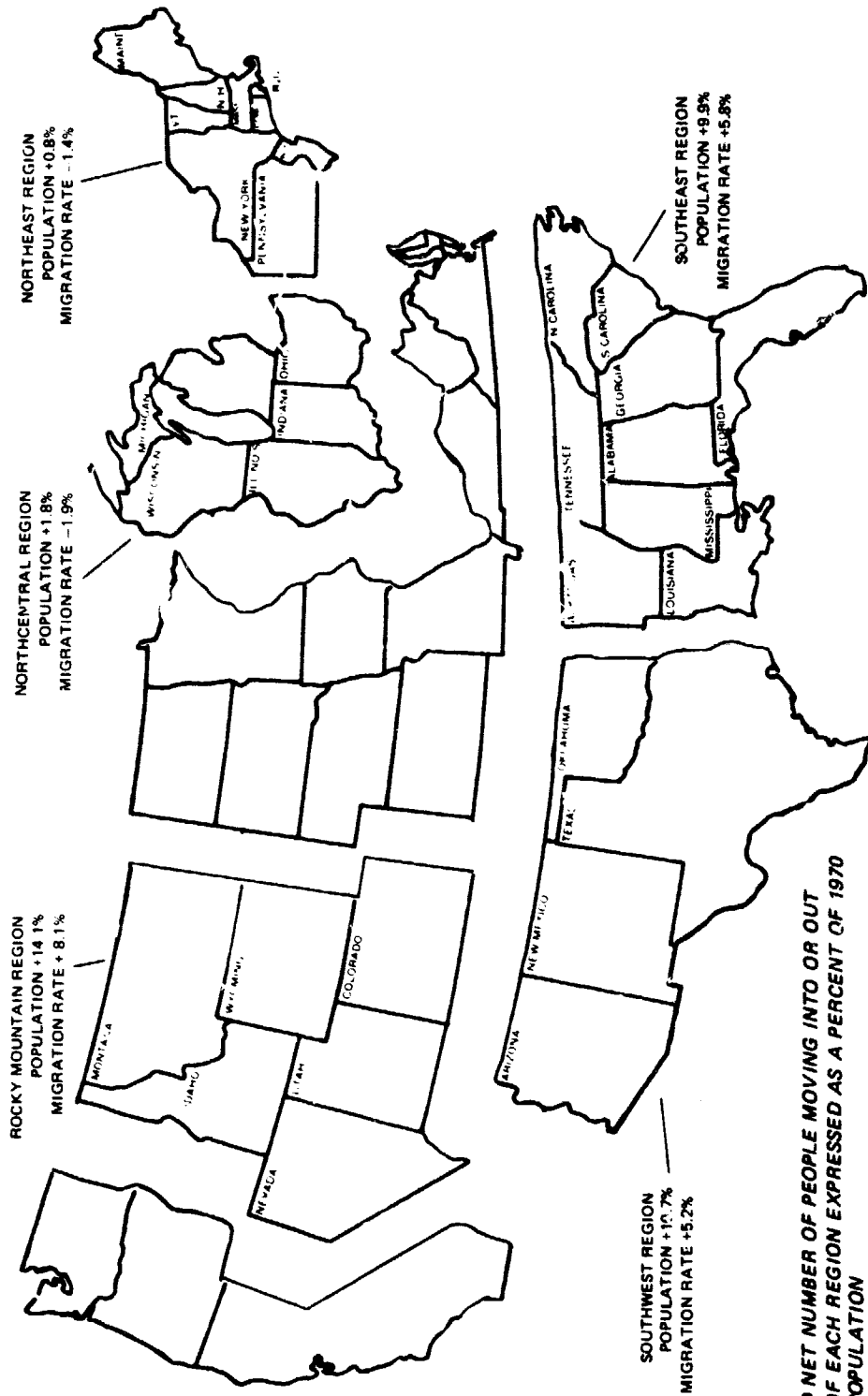
The chart on page 3 further illustrates the magnitude of the population and economic shifts.

Although opinions vary to some degree, the consensus of several Federal Government and industry sources is that the recent trends will continue into the future. For example, in 1974 the Department of Commerce's Bureau of Economic Analysis projected that population in the South would grow at a rate considerably above that for the Nation as a whole through 1990. Also Data Resources, Incorporated, predicted in a publication dated March 1977 that, while all regions would share in the national economic growth, the southern tier will continue to lead and the northeast quadrant would continue to lag.

### REASONS FOR THE SHIFTS

A variety of factors have attracted people and industry to the growing regions. With respect to the Sunbelt region, for example, these factors include

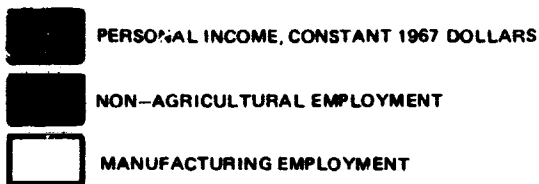
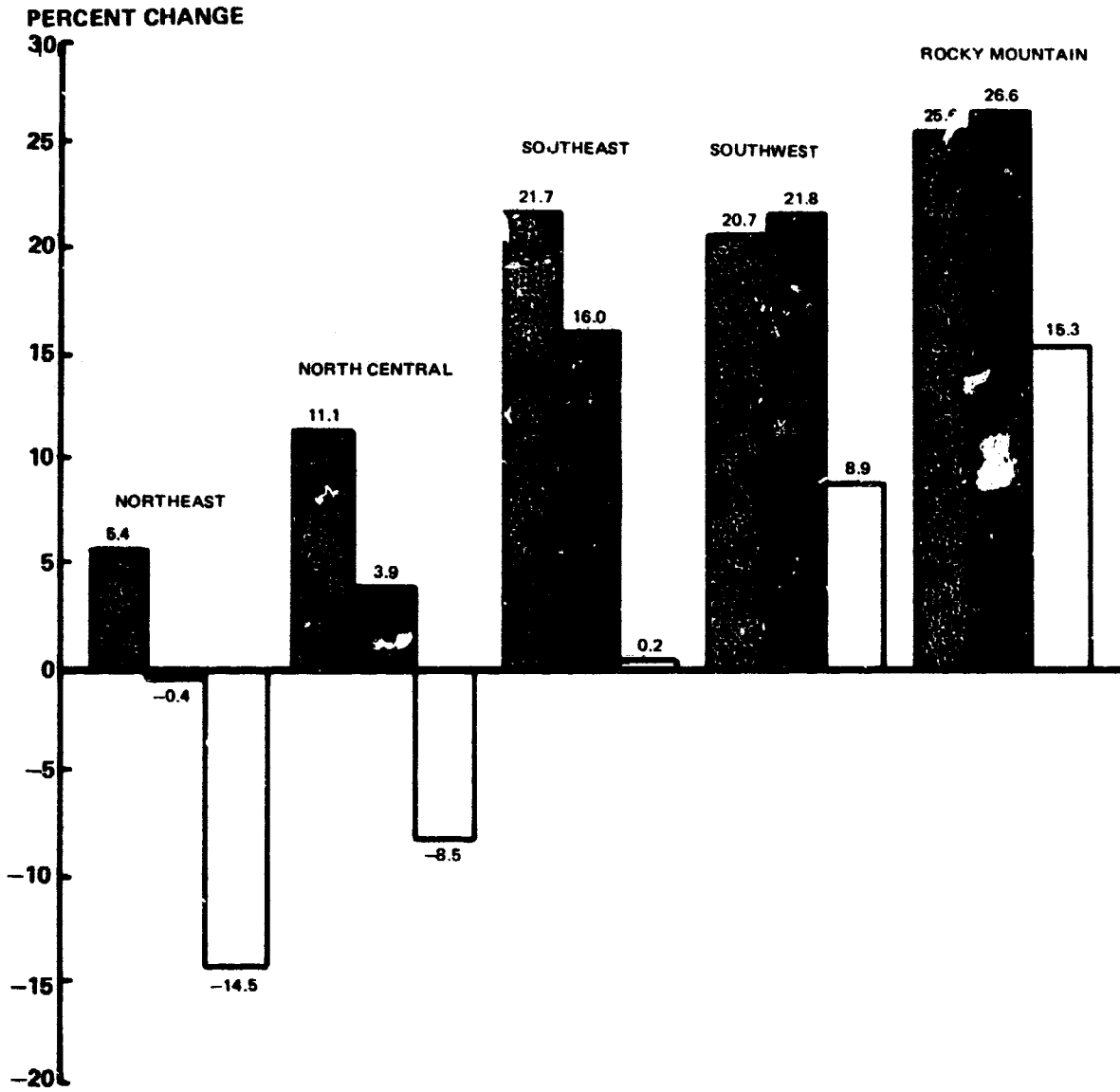
# REGIONAL POPULATION CHANGE AND NET MIGRATION RATES @ -1970 TO 1975



① NET NUMBER OF PEOPLE MOVING INTO OR OUT OF EACH REGION EXPRESSED AS A PERCENT OF 1970 POPULATION

NOTE: POPULATION INFORMATION BY STATE IS IN APPENDIX I.

# CHANGES IN REAL PERSONAL INCOME AND NON-AGRICULTURAL AND MANUFACTURING EMPLOYMENT 1970 TO 1975



- the milder climate;
- the increased use of air-conditioning, making the summers more tolerable;
- a more relaxed life style;
- a generally lower cost of living; and
- a desire to escape conditions which plague much of the North, such as high costs, physical decay, environmental degradation, and crime.

Many of these factors also apply to the Rocky Mountain region. Individuals who have retired from their principal occupations have been particularly attracted to the growing regions for the above reasons. In addition, some migration has occurred due to the increased job opportunities that have been created by the growth of industry in these regions and by energy development activities, such as the exploration and drilling for offshore oil and gas and the development and recovery of oil from shale.

Most of this industrial growth, however, has not been caused by northern-based companies closing their plants and completely relocating in those regions. Instead, when northern-based firms decided to expand their operations, they often located new plants and factories in the growing regions.

Industries have been attracted to the growing regions because of lower land, labor, and construction costs; right-to-work laws; lower tax rates; and aggressive recruiting efforts which sometimes include special concessions for new industries, such as publicly supported low-interest construction bonds, work-force training programs, and tax exemptions for new plants.

The availability and lower cost of energy has been another, though not a primary, factor motivating industry to establish offices and plants in the Sunbelt and Rocky Mountain regions. According to an official of the Fautus Company, a consulting firm specializing in plant location services, energy has been a major reason for moving only in the case of intensive natural gas-using industries, such as foundries. However, the official said that the energy incentive for these industries to move had diminished recently since most companies anticipated that intrastate natural gas would become regulated or some form of allocation system would be implemented. In either case, such companies believe that now-abundant energy supplies in these regions will become limited. Therefore, this official said that the availability or cost



of energy supplies would have little effect on industry's decision to locate in the growing regions.

A survey conducted by Industry Week 1/ magazine in January 1977 also indicated that energy was not a major reason motivating industrial shifts. In that survey, which attempted to obtain a representative perspective of industry's attitudes about the South, fewer than one-fourth of the responding firms mentioned energy supplies as a primary reason for moving to the South. Reasons more often cited were nonunion labor, lower labor costs, tax advantages, favorable climate, and access to new markets.

### IMPLICATIONS OF THE SHIFTS

The current regional shifts are having a significant impact on the Nation. The movement of people and industry is affecting the economic, social, urban, environmental, and energy characteristics of both gaining and losing regions. For example, the northern economy is experiencing a declining tax base, which often leads to higher tax rates or a cut in public services. This decline is largely attributed to employment losses and unemployment which characterize the northern economy, placing greater stresses on State and local governments.

In rapidly growing regions, urban problems are becoming more prevalent. Many rapid growth areas are experiencing a strain on their infrastructures, including streets, sewers, schools, police and fire protection, and other public services. Many cities are becoming congested and plagued by urban sprawl and increasing crime rates. As rapid growth continues, environmental problems and other factors, such as water supplies, have become of greater concern.

Energy requirements among both the gaining and losing regions have also changed with the population and industry shifts. Such changes result in energy-related problems and present opportunities to better utilize the Nation's energy resources. Because of the increasing concern over the Nation's energy problems, we focused our review on the energy implications of the shifts and the Federal, State, and private sector efforts to assess and deal with them. This report provides information on how these shifts can, and do, impact on energy use and is intended to assist the Secretary of

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1/John H. Sheridan, "Industry's View of the South \* \* \* Fruitful but Flawed," Industry Week, Feb. 28, 1977.

Energy in dealing with these energy impacts when developing future energy programs and implementing existing programs.

## CHAPTER 2

### PLANNING FOR ENERGY IMPLICATIONS OF POPULATION AND INDUSTRY SHIFTS

Planning is a key management function which provides the means for coping with complex problems within an ever changing environment. The Nation's energy problems, which have been made more complex by changes in regional growth patterns, require thorough and careful planning not only by the Federal Government but by the States and private sector as well. Through such planning and by working together, the energy implications associated with population and industry shifts can be assessed and Federal, State, and private sector efforts affected can be managed rationally and effectively.

#### ENERGY IMPLICATIONS OF DISPARATE REGIONAL GROWTH

As people and industry shift from one region to another, the demand for energy also shifts. According to the Federal Energy Administration (FEA) <sup>1/</sup>, energy consumption in the growing Sunbelt and Rocky Mountain regions increased 12 percent between 1970 and 1975 while the national average increased by only 5 percent. During the same period, energy consumption in the northeast region declined about 8 percent while increasing only 2 percent in the north-central region.

The chart on page 8 summarizes the regional changes in energy consumption between 1970 and 1975 and appendix I provides more detailed energy data on a State-by-State basis.

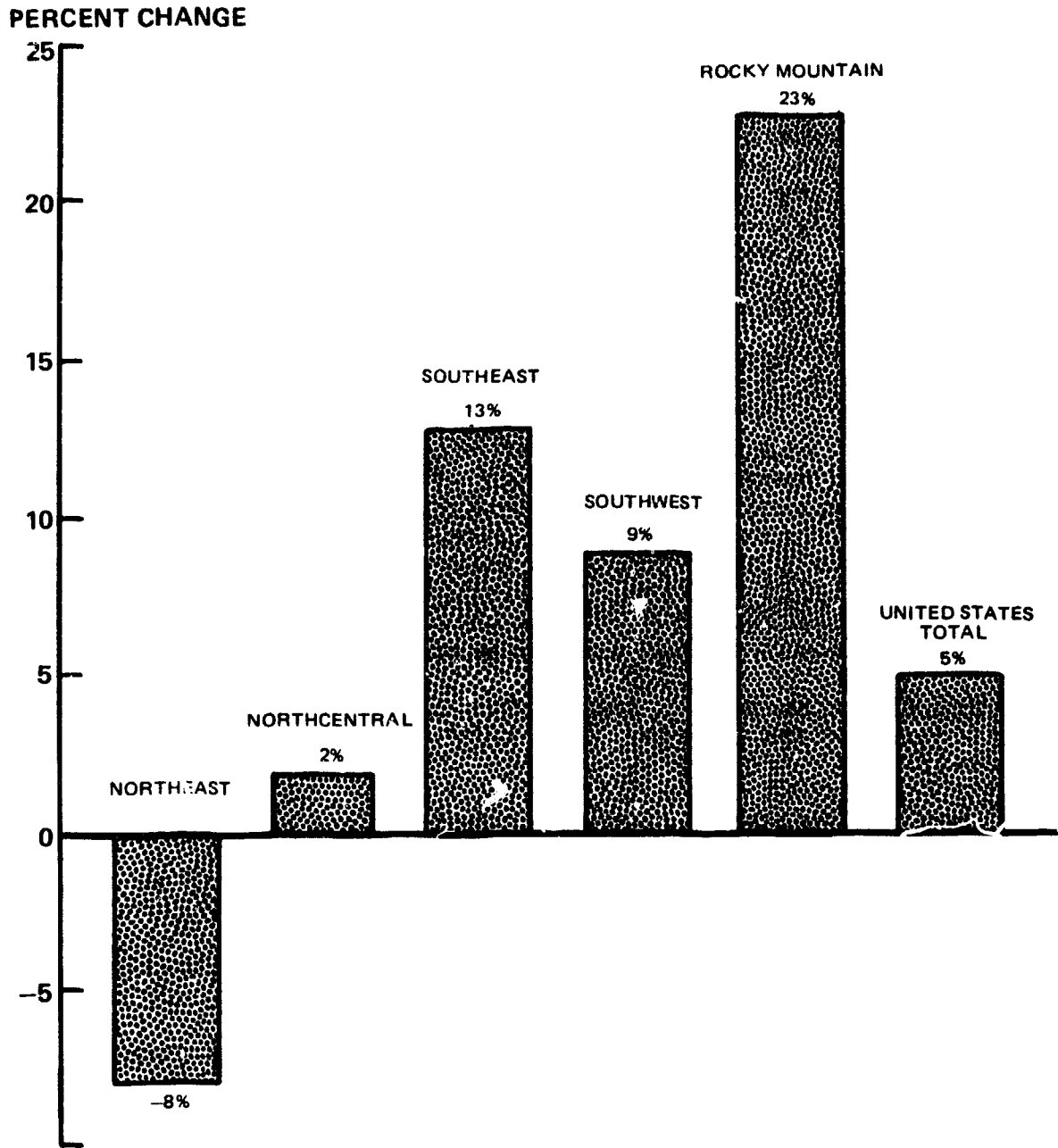
Such factors as differences in climatic conditions, energy shortages, and conservation efforts account for a portion of these energy consumption changes. However, on the basis of discussions with Federal, State, and private sector officials and our analysis of demographic data, we found that population and industrial shifts accounted for a substantial portion of the relative changes in regional energy consumption.

Associated with the disparate regional energy growth patterns are several significant energy implications. For

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<sup>1/</sup>On October 1, 1977, FEA's functions and responsibilities were transferred to the Department of Energy pursuant to the Department of Energy Organization Act (Public Law 95-91, August 4, 1977.)

# PERCENT CHANGE IN ENERGY CONSUMPTION 1970 TO 1975



instance, in rapidly growing regions, there may be a need to expand energy distribution systems as energy demand increases. This could involve constructing additional electric generating facilities, building new pipelines, or expanding other energy delivery systems to increase regional energy supplies. Conversely, in regions with declining or slowly growing energy demand, there is a need to ensure that energy distribution systems are not needlessly expanded. For example, electric utility companies serving such regions could incur excessive capital costs building greater generating capacity than justified by energy demand forecasts.

Another implication of the shifting regional energy demand is the potential to inequitably allocate controlled energy resources among the regions during energy crises such as the 1973 oil embargo. So that available energy supplies are distributed equitably during such crises, Government energy allocation procedures should be structured to (1) carefully assess any shifts in energy demand occurring since the base period established for setting allocation quotas and (2) make timely adjustment of such quotas where warranted.

Yet another and more positive implication of the shifts in growing regions is the enhanced opportunity for using conservation and renewable energy resource technologies as new factories, businesses, homes, and even entire communities are constructed. Generally, it is cheaper and more effective to build into new structures both conservation techniques and devices which use more abundant or renewable energy resources than it is to retrofit existing structures. In this regard, 24 percent of the Nation's new housing starts from 1971 through 1975 was in the growing southeast region even though the region had only 18 percent of the Nation's 1975 population. During the same period, the northeast region, with 23 percent of the Nation's population, had only 13 percent of the new housing starts. Thus greater opportunities usually exist in these growing regions to build in energy efficiencies.

There are many conservation techniques that can be used in new construction of residential and commercial buildings to greatly reduce energy use. Some examples include additional insulation in walls, floors, and ceilings; weather stripping; and reflective or double- and triple-pane windows.

In 1975 FEA funded a study to estimate the potential energy savings from incorporating conservation techniques such as those mentioned above into the design and construction of new buildings. In the study, the annual energy consumption for buildings constructed according to typical construction practices used in 1973 was compared to the estimated energy consumption for the same buildings if constructed according

to energy efficiency standards developed by the American Society of Heating, Refrigerating, and Air Conditioning Engineers, Incorporated. These standards set forth both prescriptive and performance requirements for five types of buildings--single-family residences, retail stores, low-rise apartments, schools, and offices. Prescriptive requirements set forth standards for construction specifications such as for amounts of window area, insulation, window glazing, caulking, and weather stripping. Performance requirements set forth design standards, such as design temperatures, ventilation rates for heating and cooling systems, and energy usage for electrical systems.

As illustrated in the table below, the study showed potential reductions in energy consumption ranging up to 60 percent when energy efficiency standards were applied.

Estimated Annual Energy Savings

<u>Types of buildings</u>	<u>Percent reduction in energy consumption</u>
Single-family residences	11
Retail stores	40
Low-rise apartments	43
Schools	48
Offices	60

New industrial plants and electric-generating facilities offer additional opportunities for conservation including the use of heat energy which is often wasted. Some studies have shown that waste heat accounts for as much as 25 percent of total industrial energy consumption and up to 66 percent of the energy consumption of electric utilities. In 1975 the waste heat attributed to these sources was equivalent to over 7 million barrels of oil a day. Some researchers in the energy area have reported that with proper design of industries and utilities, this waste heat can be recycled into the productive process or used to provide heat for neighboring industries or communities. Another way to use waste heat in many industries is through cogeneration, the simultaneous production of process steam and electricity.

The installation of more energy-efficient motors, generators, and furnaces in new factories can also save energy. For example, new vacuum furnaces for industrial use require only one-fourth of the energy consumed by earlier designs.

Rapid growth areas also provide an opportunity for developing integrated, energy-efficient residential/commercial/industrial communities. In such communities, for example,

industrial waste heat would provide energy for residential and commercial uses. Such efforts are long-term undertakings but can result in more efficient use of available energy resources.

In addition to using conservation techniques, incorporating into new construction devices using renewable energy resources, such as solar heating systems, can offer substantial energy savings. For example, properly installed solar heating devices can provide 50 percent or more of a building's heating requirements in certain parts of the country. Careful site orientation of buildings to make maximum use of natural heating and cooling, as well as the widespread use of heat pumps, can also achieve energy savings.

### COORDINATING ANALYSIS AND PLANNING

To be dealt with effectively, the energy implications associated with disparate regional growth require detailed analysis. The nature and magnitude of the related energy problems and potential problems can be defined, and the potential significance of the energy-saving opportunities can be assessed. Within this framework, plans can then be developed and actions taken to alleviate the problems and to capitalize on opportunities for adopting conservation techniques and using renewable resources.

The Federal Government has, and must continue to have, a critical role in evaluating national energy strategies and planning for energy sources. The Federal Government has a major role in (1) financing energy research and development, (2) establishing requirements and incentives for conservation and the use of renewable resources, (3) providing technical and financial assistance to States and localities for energy matters, such as adopting modern conservation techniques, and (4) harmonizing the varying energy needs of the different regions of the country.

The 50 State governments and the private sector also have major roles in assessing energy problems and implementing equitable solutions. For example, States and localities have primary responsibility for enforcing building codes, planning for community development, and implementing some energy programs. Also it is the private sector which actually builds energy-efficient homes and factories and expands energy distribution systems to meet the demand.

With adequate analysis and by working together, the Federal, State, and private sectors can assess the energy implications of population and industry shifts. Such

assessments will help them in formulating their efforts to ensure that:

- Regional electrical generating capacity and energy distribution systems expand or contract as regional energy requirements change.
- All States and regions receive an equitable share of available energy supplies during energy crises.
- Modern conservation methods, more abundant energy sources, and renewable energy resource technologies are used to the maximum extent practical as new structures are built.
- State and regional growth strategies are developed which adequately consider the energy impacts of economic growth and stagnation.



## CHAPTER 3

### BETTER ENERGY PLANNING NEEDED TO COPE WITH POPULATION AND INDUSTRY SHIFTS

The Federal, State, and private sectors have not fully assessed the energy implications of regional population and industry shifts. Although some plans and programs have been developed, they do not deal as effectively as possible with the related problems and enhanced opportunities to use conservation techniques and renewable energy sources. Improving the management of the programs affected by energy implications will require coordinated efforts by the three sectors to:

- Develop State-level forecasts of energy consumption which accurately reflect the differences in regional and State growth patterns.
- Analyze the energy implications of the shifts and develop plans and strategies for managing affected efforts.
- Implement plans and strategies for dealing with the energy implications in existing and future programs.

The sections below discuss the Federal, State, and private sector response to the energy implications associated with disparate regional population and economic growth.

#### THE FEDERAL RESPONSE

Prior to the establishment of the Department of Energy, the FEA and the Energy Research and Development Administration (ERDA) had primary Federal responsibility for energy analysis and policy development. In reviewing the Federal response to the energy impacts of population and industry shifts, we focused on the efforts of these two agencies.

FEA was created in 1974 as a response to the 1973 oil embargo. Although its role was initially to manage the short-term aspects of the Nation's energy problems, FEA later became the primary Federal agency responsible for energy policy development, energy data, and price regulation of crude oil and petroleum products. FEA's responsibilities also included the development and promotion of nationwide programs to increase energy conservation efforts.

ERDA had primary responsibility for energy technology research, development, and demonstration. The agency prepared and published national plans for the development and demonstration of renewable energy resources and new conservation techniques.

### Analysis of the energy implications

Before an optimum solution to most problems can be found, the nature and extent of the problems must be analyzed. As related to the energy implications of population and industry shifts, these analyses should include a detailed examination of past and projected demographic and energy statistics on a regional and State-by-State basis. Several FEA and ERDA representatives agreed that analyses of the energy impacts of population and industry shifts would be of value in planning for regional energy demands and in selecting population centers for certain conservation programs. They noted that they had made or had initiated some efforts toward making such analyses.

Both FEA and ERDA had made national forecasts of energy supply and demand and some of FEA's forecasts have been on a regional basis. However, neither agency had published long-range energy consumption projections on a State-by-State basis. Although FEA had attempted to disaggregate its national forecasts to the State level, it did not consider its projections beyond 1980 accurate enough to be called "official." FEA had initiated the development of several models to further analyze regional energy consumption. One nearing completion was a model which would project future energy demand to the year 1990 at the county level. This model is scheduled to be operational by April 1978. When this model becomes operational, FEA officials believed that accurate State forecasts could be made by aggregating county consumption estimates to the State level.

Neither FEA nor ERDA had ever made a comprehensive study of the energy effects of population and industry shifts. Both agencies, however, had sponsored research on many associated topics, some of which provide insight into the issue. For example, FEA initiated a study in November 1976 to determine whether planned expansions in electric generating capacity will ensure reliable electrical supplies through 1985. Also ERDA had completed several studies of the socioeconomic problems resulting from an influx of population to areas due to energy development. These "boom town" studies offered considerable insight into the problems associated with the much larger scale regional population shifts discussed in this report.

Another project underway at the Oak Ridge National Laboratory is attempting to develop a medium for monitoring and projecting changes in regional energy delivery and consumption patterns that may affect regional economic development. While such studies are useful and provide some insight into the implications of population and industry shifts, a broader, more comprehensive analysis of regional and State migration would be more helpful in identifying specific energy problems and in formulating actions needed to resolve them.

Programs dealing with  
the energy implications

FEA and ERDA had no programs aimed specifically at dealing with the energy implications arising from population and industry shifts. Many of FEA's programs dealt with national energy conservation measures, such as mileage standards for new automobiles, rather than regional issues such as population shifts. Most of ERDA's program activities were aimed at developing specific energy technologies and identifying the problems that must be overcome in commercializing new technologies.

However, FEA and ERDA each had several programs which indirectly addressed some of the energy impacts of disparate regional growth. For example, one of these programs which will continue under the Department of Energy is the State Energy Conservation Program established by the Energy Policy and Conservation Act of 1975. This program is intended to assist the States in establishing and implementing energy conservation plans designed to reduce projected State energy consumption 5 percent by 1980. Under this program, each State is to develop a detailed energy conservation plan including the estimated cost of its implementation and the related energy savings. Each State plan is required to include program measures for at least five areas, as follows:

- Lighting efficiency standards for public buildings (except those owned or leased by the Federal Government which are covered separately under federally imposed standards).
- Promotion of carpools, vanpools, and public transportation.
- Energy efficiency standards and policies to govern the procurement practices of the State and its political subdivisions.
- Thermal efficiency standards and insulation requirements for new and renovated buildings

(except those owned or leased by the Federal Government which are covered separately under federally imposed standards).

--Traffic regulations permitting a right turn on red light after stopping.

The energy savings from the thermal efficiency standards measure should be significant. This measure requires each State to adopt a State-wide building code that includes minimum energy efficiency standards for new and renovated buildings. The standards for new residential buildings must be no less stringent than the Department of Housing and Urban Development's minimum property standards. The standards for other new buildings must be no less stringent than the standards developed by the American Society of Heating, Refrigerating, and Air Conditioning Engineers, Incorporated, for energy efficiency in retail stores, low-rise apartments, schools, and office buildings. Considerable benefits of the thermal efficiency measure should occur in rapidly growing States where there is more new construction.

Another program which, to some extent, is intended to capitalize on the energy opportunities in growing regions is the Energy Extension Service. The program was initiated by ERDA on a pilot basis in September 1977. The primary objective of this program is to encourage small energy consumers to adopt techniques that save energy and technologies that use renewable energy resources. The program is also to identify institutional barriers to the use of new energy techniques and technologies. Ten States are currently participating in this 2-year pilot program which is scheduled to be completed on September 30, 1979. ERDA expected that the program eventually would be implemented nationwide.

The Energy Conservation and Production Act of 1976 established a number of ambitious conservation programs. One of these programs, the development of energy performance standards for all new buildings, could result in additional energy savings in new construction. Once standards are developed, States will be eligible for Federal grants to help implement the standards in all new buildings. The Department of Housing and Urban Development has begun research to develop the standards and plans to complete these standards in fiscal year 1979.

Each of these programs and others not specifically mentioned above could contribute to resolving the Nation's energy problems. However, we believe that existing and future energy programs should give greater consideration to the specific regional and State energy implications created by shifts in population and economic activity.

## Petroleum allocation procedures

An inequitable allocation of controlled petroleum products during energy crises is one of the potential energy problems associated with regional population and industry shifts. Although most petroleum products are now decontrolled and supplies are generally sufficient, allocation procedures would probably be reinstated if severe shortages were to develop.

FEA's allocation procedures for petroleum products first became effective in January 1974 as a result of the Arab oil embargo. FEA used supplier-purchaser activities in 1972 as the basis for allocations because it considered 1972 to be the most recent year of normal activity. Based on available petroleum supplies, purchasers could buy a specified percentage of the volume of fuel they bought in 1972.

Under the allocations in 1974, some rapid growth States such as Arizona and Florida, experienced significant shortages of some products partly because demand had increased substantially since the 1972 base period. Even though FEA's procedures provided for allocation adjustments because of increased demand, State energy officials told us that procedures for processing applications for increased allotments were cumbersome and resulted in delays due to FEA's slowness in acting on such applications. An FEA official told us that the allocation procedures were not flexible enough to effectively deal with shifting regional energy demand. He added, however, that allocation procedures were being reviewed to ensure that they would be more effective if implemented in any future energy shortage.

### THE STATES' RESPONSE

To examine State efforts to assess and manage the energy implications of population and industry shifts, we visited State energy offices and economic development agencies in eight States. Two of these States--New York and Ohio--are in slow growth regions and six--Arizona, Colorado, Florida, North Carolina, Oklahoma, and Texas--are in rapid growth regions. Appendix II summarizes key demographic and energy statistics for these States.

#### Analysis of the energy implications

None of the States we visited had made a comprehensive analysis of the energy problems and opportunities associated with regional population and industry shifts. Each State maintained some historical and projected demographic and energy statistics and some States had analyzed the relationships

between population, economic, and energy growth. However, the States had not made specific studies of the shift-related problems, opportunities, and alternatives, nor had they made any plans for dealing with them.

The diversity and sophistication of available historical and projected energy statistics varied considerably among the eight States. For example, Ohio and North Carolina had developed energy consumption statistics for their respective States through 1976 classified by type of user and type of fuel. North Carolina and Oklahoma had projected energy consumption through 1990 using models which reflected shifts in population. In contrast, one State visited had only compiled total consumption figures through 1972 and another State's energy office had made no projections of its future energy demand.

Arizona, Colorado, and Florida had completed studies of possible energy sources in their respective States. In general, each study asserted several possible growth rates, projected future population and economic activity based on each of the rates, and then estimated future energy demand for each scenario. Of these States, only Florida had adopted an overall growth policy which considered the energy consequences of growth. While the Florida policy does not include growth restrictions, it does call for growth management--controlling the location and kind of growth. Arizona and Colorado also have growth strategies which suggest that growth in their States should be managed.

None of the States visited considered energy to be a factor inhibiting future economic and industrial development. Officials in several States said that it was the Federal Government's responsibility to ensure that their States receive the energy supplies they need. However, the importance of energy to industrial development and the need for energy planning at the State level is clearly illustrated in one Sunbelt State we visited. In that State, the effects of the 1976-77 natural gas shortage were particularly severe. Many companies were forced to temporarily close their plants at the height of the shortage and some actually moved their operations to other States where natural gas was more plentiful. While the natural gas shortage itself was beyond the control of the State, the State could take some actions which would lessen the impact of any future shortages such as actively encouraging its industries and residents to use more abundant alternative fuels.

#### Programs dealing with the energy implications

States visited did not have programs aimed specifically at the energy implications of population and industry shifts,

but each State had initiated or had plans to initiate measures which, to varying degrees, addressed some of the energy implications associated with disparate regional growth. For example, since all States visited were participating in the State Energy Conservation Program, each had agreed to adopt State-wide thermal efficiency standards for new and renovated buildings. These standards take advantage of some of the conservation opportunities inherent in new construction. We were told that one State was considering energy efficiency construction codes more stringent than the minimum standards required by the program.

Several of the States visited encouraged the use of renewable energy resources, such as solar energy through financial incentives. Texas, for instance, exempts the manufacture and sale of solar, wind, and other renewable energy devices from State sales and franchise taxes. Arizona also exempts solar devices from sales tax and further allows a State income tax deduction for the installation of certain solar heating and cooling devices. Colorado and New York allow property tax concessions on increased property values from solar installations. The incentives, however, do not appear to be of sufficient magnitude to significantly increase the use of renewable energy sources. For example, Arizona officials told us that the monetary savings of their incentive amounted to only 3 or 4 percent of the cost of a solar heating system. The Assistant Director of the Arizona Energy Office estimated as few as 30 people had taken advantage of the tax deduction since it became effective in May 1975.

As discussed in chapter 2, one of the implications of population and industry shifts is the need to ensure that energy distribution systems expand in a manner consistent with the expected energy growth. Except for new electrical generating capacity, most States visited did not closely monitor the private sector's plans for expanding the energy distribution systems in their States. Officials in two of these States said the expansion of natural gas, petroleum products, and coal distribution networks was a private sector prerogative and not a responsibility of the State government.

Most States monitored the expansion plans of electric utility companies. For the most part, States required electric utilities to submit long-range forecasts of electricity demand and generating capacity including plans for required new facilities. These forecasts were generally reviewed for accuracy, and four States made independent electric demand forecasts for comparison. All but one State visited had approval authority for the construction of new generating plants.

The importance of monitoring energy distribution systems is illustrated by the electrical generating capacities in a slow-growth State we visited. Several years ago electric utilities in the State anticipated a substantial growth rate in electricity demand and constructed additional generating facilities. Because projected growth did not materialize as expected, several utilities in the State currently have greater reserve capacity than needed. Although the detrimental effects to society of expanding energy distribution networks too fast is probably less than the effects of expanding too slowly, we believe States can help ensure that neither happens by monitoring expansions in light of accurate population, economic activity, and energy demand forecasts and by taking appropriate timely actions where needed.

As discussed above, the States we visited had not fully analyzed or planned for the energy implications associated with population and industry shifts. According to a May 1977 report by the National Governors' Conference, State energy efforts were inhibited for several reasons. One problem has been the uncertainty in the availability and level of Federal funding for energy programs. For example, of the \$100 million authorized for the State Energy Conservation Program for fiscal years 1976 and 1977, only \$30 million was appropriated. Another problem cited in the report was the inadequacy of Federal technical assistance to the States. The report concluded that the Federal technical assistance available to the States for developing energy conservation programs was inadequate; underfunded; understaffed; and, at times, nonexistent.

#### THE PRIVATE SECTOR RESPONSE

To determine the extent to which the private sector has assessed and planned for the energy implications of population and industry shifts, we contacted several major oil companies to identify studies and other private research performed on the subject.

We identified no major studies or private research which comprehensively analyzed the energy problems and opportunities resulting from population and industry shifts. Although many related energy topics have been studied such as the impacts of rapid community growth due to energy projects, analyses of the energy effects of disparate regional growth are generally lacking in the private sector.

Officials of two oil companies visited, however, said that regional population shifts were considered in their models which predicted future regional energy needs. One company, through the use of demographic data from the Bureau of Census,



Department of Commerce, and the National Planning Association--  
a nonprofit institution which conducts economic research--  
projected energy consumption patterns by region to the year  
2000. According to a representative of this company, these  
projections were used to determine future energy investments,  
including expansions in the company's distribution system.

## CHAPTER 4

### CONCLUSIONS, RECOMMENDATIONS, AND AGENCY VIEWS

#### CONCLUSIONS

Since 1970 dramatic shifts in population and economic activity have occurred among the regions of our Nation. Accompanying these shifts are significant energy implications. For this reason, detailed analyses and careful planning are needed to prevent problems and to help maximize the enhanced conservation opportunities which result from population and industry shifts. The Federal, State, and private sectors have made progress towards assessing the energy implications and considering such implications in their plans and programs. We believe, however, that such assessments and plans can be greatly improved.

The Federal, State, and private sectors have made or initiated several assessments of the energy implications of regional population and industry shifts. Many studies have been completed on energy topics which to some extent consider the implications of regional shifts. The Federal Government has also consolidated its energy efforts in the Department of Energy which should aid in establishing uniform requirements for States to develop and implement conservation measures. However, we noted that comprehensive analyses were generally lacking and that long-range energy consumption forecasts on a State-by-State basis had not been available at the Federal level.

Necessary information, based on detailed analyses, has not been available to develop plans and programs which effectively deal with shift-related energy problems or take advantage of opportunities. While several Federal and State programs indirectly address some of the energy impacts of disparate regional growth, we did not find any programs aimed specifically at the problems and opportunities arising from regional shifts. Also, because of timelags in making petroleum allocation adjustments due to changes in demand, the potential exists for misallocating available petroleum supplies among the regions during energy crises.

Few of the States we visited considered energy issues within an overall framework of State growth planning and analysis. Although most States monitor expansions in electrical generating capacity, most States did not monitor expansions of other energy distribution systems to ensure that expansion parallels expected growth.

To effectively deal with the energy implications of population and industry shifts will require coordination of efforts by the Federal, State, and private sectors to:

- Develop State-level forecasts of energy consumption which accurately reflect the differences in regional and State growth patterns.
- Analyze the energy implications of the shifts and develop plans and alternative strategies for dealing with them.
- Implement plans and strategies for dealing with the energy implications in existing and future programs.

Such coordinated efforts should help the Federal, State, and private sectors focus their programs on the potential energy problems and, perhaps more important, on the opportunities resulting from population and industry shifts. For example, programs can place greater emphasis on using more stringent energy conservation standards in buildings, more abundant alternative fuels, and renewable resources in rapidly growing areas where new construction is more predominant. In this way such programs can take advantage of the lower costs associated with building in new energy technologies.

We believe that the Department of Energy should encourage State governments to analyze alternative growth policies and the resultant energy consequences of each. From such analyses, State decisionmakers can develop and implement growth strategies which effectively integrate State energy policies and capabilities with those of the Nation.

We further believe that the Department should encourage each State to:

- Assess on a continuing basis, the energy implications of population and industry shifts to or from the State.
- Monitor the expansion of the energy distribution systems within the State to ensure that the systems expand in a manner consistent with expected growth in energy demand.

To achieve the goals of energy programs in the shortest possible time, it is essential that the energy implications of population and industry shifts be adequately considered in developing program plans and procedures. Such consideration should help the Department ensure that its programs

address potential regional problems and opportunities and are responsive to the regional energy needs of the Nation.

### RECOMMENDATIONS

GAO recommends that the Secretary of Energy:

- Identify and assess, on a continuing basis, the nature and extent of national and regional energy implications of population and economic shifts. This should include the preparation of detailed, long-range forecasts of energy consumption on a State-by-State basis.
- Consider the energy implications of population and industry shifts in carrying out existing and future programs designed to assist the States in dealing with their energy problems.
- Revamp petroleum allocation procedures to give timely consideration to shifting regional energy demand to ensure that, during severe energy shortages, all regions and States receive an equitable share of available energy supplies.
- Encourage each State to take the initiative to (1) assess the energy implications of population and industry shifts to and from their respective States, (2) monitor the expansion of the energy distribution systems within each State to ensure that such expansions are consistent with the expected growth in energy demand, and (3) implement effective mechanisms for encouraging the use of conservation methods, more abundant alternative fuels, and renewable resources in new construction.

### AGENCY VIEWS

In commenting on this report, Department of Energy officials acknowledged that changes in the regional distribution of economic activity and population are important determinants of changing patterns of energy use, that rapid regional shifts can cause serious problems for State and local governments, and that better information and planning could contribute to the relief of the problem.

Accordingly, Department of Energy officials have basically agreed with our recommendations and stated that they are taking actions to implement them. Such actions include developing a long-range forecast of energy consumption on a State-by-State basis, designing the methodology needed to make an energy use survey of the residential sector, revising regulations

to give more timely consideration to regional shifts in energy demand, and developing procedures by which data from improved forecasts will be communicated and made available to the States. However, these officials pointed out that the earliest their long-range forecast of energy consumption on a State-by-State basis will be available is fiscal year 1979 and that reliable energy use data of residential sectors would not be available for several years.

## CHAPTER 5

### SCOPE OF REVIEW

This report presents the results of work on the energy implications associated with regional population and industry shifts. We interviewed officials and analyzed pertinent documentation at the Department of Energy and at two of its predecessor agencies--FEA and ERDA. We also conducted work at the following eight States: Arizona, Colorado, Florida, New York, North Carolina, Ohio, Oklahoma, and Texas.

State selections were based on historical and projected population, economic activity, and energy consumption trends and on the availability and nonavailability of indigenous energy resources. At each State, we contacted the primary energy agency and, in most cases, the State utility commission and the industrial or economic development organization.

We obtained statistical information on population, economic activity, and energy trends and reviewed available studies and reports on the implications of disparate regional growth. In addition, we obtained information from the National Governors' Conference, the National Conference of State Legislatures, and several private energy companies.

**APPENDIX I**

**CHANGES IN REGIONAL AND STATE POPULATION AND ENERGY CONSUMPTION FROM 1970 TO 1975**

**APPENDIX I**

Region and State	Population (note a)				Energy consumption (note b)		
	1970 (thousands)	1975	Percent change	Net migration rate (note c)	1970 (Trillions of BTU's)	1975	Percent change
<b>NORTHEAST:</b>							
Connecticut	3,032	3,095	2.1	- 0.5	704	689	- 2.1
Maine	994	1,059	6.5	3.7	255	287	12.5
Massachusetts	5,689	5,828	2.4	0.4	1,421	1,321	- 7.0
New Hampshire	738	818	10.8	7.5	185	145	- 22.2
New Jersey	7,171	7,316	2.0	- 0.5	1,854	1,505	- 18.3
New York	18,242	18,120	- 0.7	- 3.0	4,394	3,891	- 11.4
Pennsylvania	11,801	11,827	0.2	- 1.5	3,954	3,885	- 1.7
Rhode Island	950	927	- 2.4	- 4.5	195	150	- 23.1
Vermont	445	471	5.8	2.5	86	116	33.6
Region total	<u>49,062</u>	<u>49,461</u>	0.8	- 1.4	<u>13,048</u>	<u>12,039</u>	- 7.7
<b>NORTHCENTRAL:</b>							
Illinois	11,113	11,145	0.3	- 3.1	3,530	3,705	5.0
Indiana	5,196	5,311	2.2	- 1.8	2,274	2,357	3.6
Michigan	8,882	9,157	3.1	- 1.2	2,717	2,815	3.6
Ohio	10,657	10,759	1.0	- 2.6	3,746	3,690	- 1.5
Wisconsin	4,418	4,607	4.3	1.1	1,315	1,338	1.7
Region total	<u>40,266</u>	<u>40,979</u>	1.8	- 1.9	<u>13,583</u>	<u>13,905</u>	2.4
<b>SOUTHEAST:</b>							
Alabama	3,444	3,614	4.9	0.6	1,369	1,589	16.1
Arkansas	1,923	2,116	10.1	6.5	672	689	2.6
Florida	6,791	8,357	23.1	20.9	1,528	1,862	21.9
Georgia	4,588	4,926	7.4	2.1	1,123	1,392	23.9
Louisiana	3,642	3,791	4.1	- 1.0	2,380	2,567	7.9
Mississippi	2,217	2,346	5.8	0.4	661	632	- 4.5
North Carolina	5,084	5,451	7.2	2.7	1,364	1,340	- 1.8
South Carolina	2,591	2,818	8.8	3.4	647	858	32.5
Tennessee	3,926	4,188	6.7	2.9	1,162	1,410	21.3
Region total	<u>34,206</u>	<u>37,607</u>	9.9	5.8	<u>10,906</u>	<u>12,338</u>	13.1
<b>SOUTHWEST:</b>							
Arizona	1,775	2,224	25.3	18.7	493	633	28.4
New Mexico	1,017	1,147	12.8	5.8	543	574	5.8
Oklahoma	2,559	2,712	6.0	2.7	1,009	1,131	12.1
Texas	11,199	12,237	9.3	3.7	5,897	6,275	6.4
Region total	<u>16,550</u>	<u>18,320</u>	10.7	5.2	<u>7,941</u>	<u>8,614</u>	8.5
<b>ROCKY MOUNTAIN:</b>							
Colorado	2,210	2,534	14.7	9.6	689	824	19.7
Idaho	713	820	15.0	8.8	237	301	26.8
Montana	694	748	7.8	3.7	307	331	7.6
Nevada	489	592	21.1	16.0	181	293	61.5
Utah	1,059	1,206	13.9	3.7	378	445	17.6
Wyoming	332	374	12.7	7.5	284	353	24.1
Region total	<u>5,497</u>	<u>6,274</u>	14.1	8.1	<u>2,077</u>	<u>2,546</u>	22.6
<b>OTHER STATES:</b>							
Alaska	303	352	16.2	6.6	178	229	29.2
California	19,971	21,185	6.1	2.2	5,089	5,346	5.1
Delaware	548	597	8.9	1.6	191	213	11.4
Hawaii	770	865	12.3	4.4	191	202	5.8
Iowa	2,825	2,870	1.6	- 0.8	857	898	4.7
Kansas	2,249	2,267	0.8	- 2.0	915	932	1.8
Kentucky	3,221	3,396	5.4	1.8	1,144	1,240	8.4
Maryland	3,924	4,098	4.4	0.9	1,041	988	- 5.2
Minnesota	3,806	3,926	3.2	- 0.2	1,053	1,202	14.2
Missouri	4,678	4,763	1.8	- 0.6	1,317	1,427	8.4
Nebraska	1,485	1,546	4.1	0.9	457	547	19.9
North Dakota	618	635	2.8	- 1.1	239	266	11.4
Oregon	2,092	2,288	9.4	6.4	703	773	10.0
South Dakota	666	683	2.6	- 0.9	220	254	15.6
Virginia	4,651	4,967	6.8	2.7	1,196	1,222	2.2
Washington	3,413	3,544	3.8	0.5	1,376	1,626	18.1
District of Columbia	757	716	- 5.4	- 8.1	197	113	- 39.4
West Virginia	1,744	1,803	3.4	0.6	954	1,161	21.6
Other states total	<u>57,721</u>	<u>60,501</u>	4.8	1.2	<u>17,307</u>	<u>18,638</u>	7.7
U.S. total	<u>203,302</u>	<u>213,142</u>	4.8		<u>64,861</u>	<u>68,080</u>	5.0

a/Bureau of the Census.

b/Federal Energy Administration. Statistics exclude energy resources consumed as petrochemical feedstocks and raw materials. One British thermal unit (Btu) is the amount of heat required to raise the temperature of 1 pound of water 1 degree Fahrenheit.

c/Net number of people moving into or out of the State expressed as a percent of 1970 population.

DEMOGRAPHIC AND ENERGY STATISTICS FOR STATES VISITED

Statistic	Arizona	Colorado	Texas	Oklahoma	Florida	North Carolina	Ohio	New York
Population, 1975	2,224,000	2,534,000	12,237,000	2,712,000	8,357,000	5,451,000	10,759,000	18,120,000
Percent change in population, 1970-1975	25.3	14.7	9.3	6.0	23.1	7.2	1.0	- 0.7
Net migration rate, 1970-1975 (note a)	18.7	9.6	3.7	2.7	20.9	2.7	- 2.6	- 3.0
Percent change in nonagricultural employment, 1970-1975	32.3	27.7	21.4	15.3	26.8	12.0	3.3	- 5.1
Percent change in manufacturing employment 1970-1975 (thousands)	7.1	14.8	8.0	11.7	1.9	2.5	-10.6	-20.1
New housing units, cumulative total, 1970-1975 (thousands)	229.3	233.1	589.3	119.2	984.3	216.4	373.8	423.3
Energy consumption, 1975 (trillions of Btu's) (note b)	632.7	824.3	6,275.3	1,131.3	1,862.2	1,339.6	3,689.7	3,891.1
Percent change in energy consumption, 1970-1975	28.4	19.7	6.4	12.1	21.9	- 1.8	- 1.5	-11.4

a/Net number of people moving into or out of the State expressed as a percent of 1970 population.  
 b/Energy consumption statistics excluding energy resources consumed as petrochemical feedstocks and raw material.