Nebraska Community Energy Management Program

Lexington Energy Study 1983

nebraska energy office

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People at the Local Level Will Determine
Their Energy Needs for Today and Tomorrow

The Nebraska Energy Office is committed to assisting local communities plan for their own energy futures. Lasting energy conservation and planning must happen in city halls, churches, and in civic group meetings all across Nebraska. The Nebraska Energy Office will be there--organizing, researching, and supporting them along the way towards energy independence.

The Nebraska Community Energy Management Program has selected three towns--Fremont, Lexington, and Bayard--to serve as pilot cities. A four-phased planning and action program starts with the formation of a local energy committee representing as many different segments of the community as possible. The Nebraska Energy Office then provides an energy specialist who conducts a data analysis of the energy used by type and consumption. In a subsequent town energy meeting, the data is presented and the assembled group determines how to concentrate community efforts to minimize energy consumption. With the help of the Nebraska Energy Office, a comprehensive energy management plan is developed. In the last phase, local activities are developed to implement the plan selected.

The Lexington Energy Study was prepared by Skip Laitner of the Community Action Research Group under contract with the Nebraska Energy Office for the pilot phase of the Nebraska Community Energy Management Program in Lexington, Nebraska.

The Nebraska Energy Office also acknowledges the support and cooperation of the Lexington Chamber of Commerce and the Lexington Energy Committee for their commitment and cooperation in the Nebraska Community Energy Management Program. Voluntarily serving on the Lexington Energy Committee are:

Jim Bishop	Deloy Jahnke
Pete Bishop	George Keller
Cliff Bossung	Jim Kelly
Craig Brock	Glenn Knapple
Eric Brown	Leon Malzahn
Diane Carson	Randy Nelson
Ed Darby	Bill Podraza
Dutch Ernst	Dick Rogers
Rob Fritz	Blanche Senior
Dan Grafton	Joe Taft

Nebraska Community
Energy Management Program

--Ann Brockhoff
Community Energy Manager
Nebraska Energy Office
October 26, 1983

EXECUTIVE SUMMARY

Energy is essential for a healthy economy, but higher prices for energy resources can spell trouble for communities such as Lexington, Nebraska. People typically think of energy costs only when their monthly utility bills arrive or when they pull into a local filling station to fill up the gas tank. Few realize, however, just how much energy "costs" their community in terms of lost economic development. As energy costs grab more and more investment capital or take a bigger bite out of disposable income, many people find that local energy management strategies not only ease the budgetary pressures confronting families and businesses, but they also become the cornerstone of renewed economic development.

Experts differ on the degree to which energy prices have contributed to present economic problems. But all agree that the cumulative impact is pervasive. Farmers, for instance, see the effect directly in the higher prices they pay for diesel fuel or propane, and indirectly in the higher prices for such items as pesticides and fertilizers. With each dollar increase in the wholesale price of a thousand cubic feet (MCF) of natural gas, the price of anhydrous ammonia may climb another $40 per ton--almost 20% more than is now paid.

Senior citizens and low-income families see the effects not only in their heating bills, but in their food and medicine costs as well. In the latter case 80% of pharmaceuticals are petroleum-based which means that as oil prices jump, retail prices for medicines must also increase.

Since money spent on energy tends to produce fewer jobs than money spent on other goods and services, diverting money from agricultural and manufacturing sectors to pay for higher energy bills creates or maintains high unemployment levels. Officials with the Treasury Department see the effect of energy costs in the form of fewer tax receipts since the unemployed are no longer paying taxes. Finally, as the massive utility and oil company construction programs soak up available capital, interest rates are escalated in response to a demand for money that exceeds the supply. This is an indirect cost of energy that threatens the stability of innumerable businesses who already flirt with bankruptcy.

Although Lexington is not an especially energy-intensive community compared to other parts of the country, the impact of rising energy prices appears to be significant nonetheless. It is estimated that the 7040 people living in Lexington consumed a total of 1.30 trillion Btus* in 1982. This is approximately 185 million Btus for each man, woman and child in the town. This total includes energy purchased for transportation and business as well as for the home.

By converting the different energy resources into a common unit of measurement - a gallon of gasoline - we find that each resident consumed the equivalent of 1477 gallons of gasoline to maintain the 1982 standard of living in the community. The total energy bill for Lexington is pegged at $11 million, most of which is exported from Nebraska in order to import the needed energy supplies.

Including only real cost increases (in other words, eliminating the effects of inflation), and assuming only a modest growth in overall energy consumption and price increases, the annual costs of retail energy purchases will jump perhaps seven percent each year the community delays implementation of an aggressive energy management program. If there are no dramatic shifts in costs caused by events such as another oil price shock or the accelerated decontrol of natural gas prices at the wellhead, this means that by 1990 Lexington businesses and residents would be paying almost $20 million for energy under a "business-as-usual" scenario. As measured in 1982 dollars, the net economic benefits to Lexington would be $13 million less than if the total energy bill remained at the present level as a result of a successful energy management effort that could offset the effect of higher prices. Thus, improved efficiency in energy use has the potential of reducing these energy costs in a way that can provide an economic stimulus to the community.

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*A Btu is a measure of heat contained in a fuel. It is roughly equal to the amount of heat generated by the complete burning of an ordinary wooden kitchen match. For reference, there are 3,413 Btus in each kilowatt-hour of electricity that is purchased; 124,950 Btus in a gallon of gasoline; and 994,000 Btus in each thousand cubic feet (MCF) of natural gas.

ENERGY AND NEBRASKA

In order to evaluate fully the energy consumption patterns in a community such as Lexington, it helps to develop a framework that provides the reader with a point of reference. For that reason the discussion here begins with a brief look at the Nebraska energy situation. As Figure I illustrates, the state purchases about five percent less retail energy per capita than neighboring Iowa and 25% less than the United States as a whole. Table A supplements this picture by providing a snapshot of where Nebraska uses its energy and in what form the energy is supplied to the state's ultimate users.*

*When referring to energy consumption patterns there generally are two perspectives mentioned: end-use consumption which refers to the retail purchases of consumers indicating whether they are residential or industrial users; and gross consumption which reflects total energy used including energy that is lost in the generation and transmission of electricity. Table A illustrates this difference. Nebraska's 1982 gross consumption, including electrical losses, was 533.8 trillion Btus. The end-use purchases totaled 355.2 trillion Btus, however. Since it is the economic impacts that concern us in this analysis, it is the latter figure which interests us, especially the price paid for the purchased energy. As with any cost of doing business, expenses such as energy losses are incorporated in the retail prices and so are implicit in the discussion of end-use consumption. All references in this report -- again, since we are looking at the economic rather than the engineering impacts of energy -- will be in terms of retail purchases.

In reviewing Table A, for example, we find that transportation is Nebraska's most energy-intensive sector. This is not so surprising when you consider two interesting statistics. First, Nebraska has 16% more registered motor vehicles per capita than the United States as a whole; and second, reflecting its rural nature, the state has more than three times the total highway miles per capita than the U.S.

FIGURE I

COMPARISON OF PER CAPITA RETAIL ENERGY CONSUMPTION

PURCHASED IN THE U.S., NEBRASKA AND IOWA
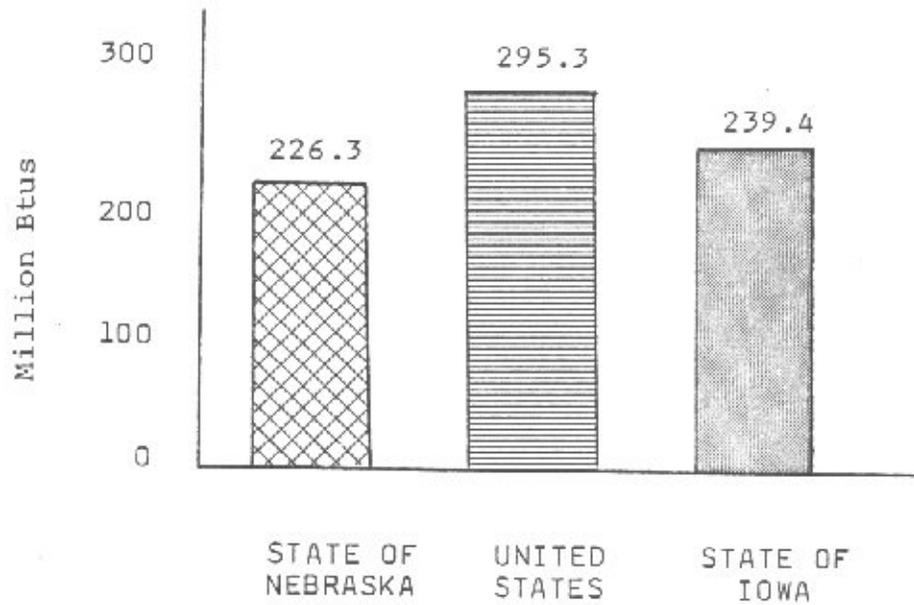
Source: Calculated from data provided by the U.S. Department
of Energy, the Nebraska Energy Office and the Iowa Energy
Policy Council.

TABLE A

COMPARISON OF NEBRASKA END USE ENERGY CONSUMPTION BY SECTOR

(in 1982 trillion BTUs)

	Residential	Commercial	Industrial	Agricultural	Transportation	Total
Coal	0	.4	6.9	0	0	7.3
Natural Gas	58.1	33.6	30.3	9.8	0	131.8
Gasoline	0	0	0	4.4	94.2	98.6
Aviation Fuel	0	0	0	0	4.0	4.0
Propane LP	4.1	2.7	1.2	8.2	0	16.2
Distillates	2.6	6.3	5.4	19.9	17.4	51.6
Electricity	19.4	13.2	8.9	4.2	0	45.7
End-use Total	84.2	56.2	52.7	46.5	115.6	355.2
Losses in transmission and distribution of electricity	75.8	51.6	34.8	16.4	0	178.6
Total including losses	160.0	107.8	87.5	62.9	115.6	533.8

Source: 1982 Annual Report, Nebraska Energy Office

As further noted in Table A, retail sales of energy in Nebraska consist mainly of natural gas, gasoline, distillate fuels such as home heating oil and diesel fuel, and electricity. Refined petroleum products are the single largest contributor of energy consumed in Nebraska and accounted for 43% of the end-use energy consumed in the state in 1982. Natural gas was the second largest source of energy comprising 37% of the total energy consumed, and electricity was the third largest energy source, providing just under 13% of the 1982 demand for energy.

Only small amounts of these various natural resources are available in Nebraska for energy production. This means that most of Nebraska's energy must be imported, which in turn means that dollars must be exported to pay for the energy. Alternate energy sources hold promise for the future, although in 1982 alternatives such as solar, wind, biomass and alcohol fuels provided less than 1% of the energy consumed in the state. Among these alternatives, the ethanol portion of gasohol accounted for approximately 1% of the fuel used by motor vehicles.

With this information, together with census and other demographic data, we can build an energy usage profile specifically for Lexington. The results of this profile are illustrated in Table B.

TABLE B

1982 LEXINGTON RETAIL ENERGY PURCHASES BY SECTOR

(in trillion Btus)

Residential	0.37
Commercial/Industrial	0.31
Transportation	0.62
TOTAL	1.30

Estimated 1982 Lexington Energy Bill: $11.1 million

Source: Totals calculated from various demographic data
provided by the U.S. Census, the Nebraska Energy Office
and the Nebraska Department of Economic Development
(see text of report for full information).

AN ENERGY PROFILE OF LEXINGTON

When we speak of an energy profile for Lexington, Nebraska, we are referring to the amount of energy purchased by end-users who live or do business within the city limits of Lexington. However, since many energy transactions and users are not strictly confined to Lexington--for instance, many persons who purchase gasoline in the town may not actually live or do business within the city limits -- the resulting profile is only an approximation of consumption for the community.

Another point to be kept in mind is that the profile has been constructed from a combination of actual use data and from estimates derived from a statistical analysis based upon demographic data such as population, income, automobile registrations, retail sales, industrial activities and so forth. This information was obtained from sources including the U.S. Census data for Lexington and Dawson County, the Nebraska Energy Office and the Nebraska Department of Economic Development.

While a more accurate profile could be generated by conducting an extensive end-use survey of each of the major sectors, such an effort would cost far more than funds presently allow. Nonetheless, to illustrate the magnitude of the economic impacts resulting from a "business-as-usual" approach to continued energy consumption, the methodology used to generate the profile of this report provides a sufficient statistical base to conclude that a major opportunity exists to improve the economic well-being of Lexington through an energy management program. The conclusions in the report are believed to be accurate within a margin of plus or minus ten percent.

In 1982 Lexington's energy consumption was approximately 1.30 trillion Btus. To provide a more meaningful illustration of what this number represents, we can put it in the context of how much equivalent gasoline it represents for each of the 7040 residents. Since one trillion Btus is comparable to the energy contained in about eight million gallons of gasoline, we might say, instead, that local residents and businesses consumed the equivalent of 10.4 million gallons of gasoline for all 1982 end-use energy needs--approximately 1477 gallons per person. The total energy for the community is pegged at $11.1 million in 1982, about $1,577 per capita.

As the pie charts indicate (Figures II and III), the trans- portation sector is the most energy-intensive area of the Lexington economy. This is consistent with the state profile.

Refined petroleum products are the town's largest energy resource, providing about 51% of Lexington's total energy needs when compared to an equivalent Btu basis. This is followed by natural gas at 34% and electricity at 17%. In terms of actual consumption measures, these percentages are broken down into the following estimated annual purchases:

* Natural gas   440,000 thousand cubic feet (MCF)
* Transportation Fuel   4,930,000 gallons
* Electricity   58,033,000 kilowatt-hours
* Miscellaneous fuel   470,000 gallons

To better understand how usage impacts upon an economy such as Lexington's, it is helpful to break the consumption pattern into a sector-by-sector analysis.
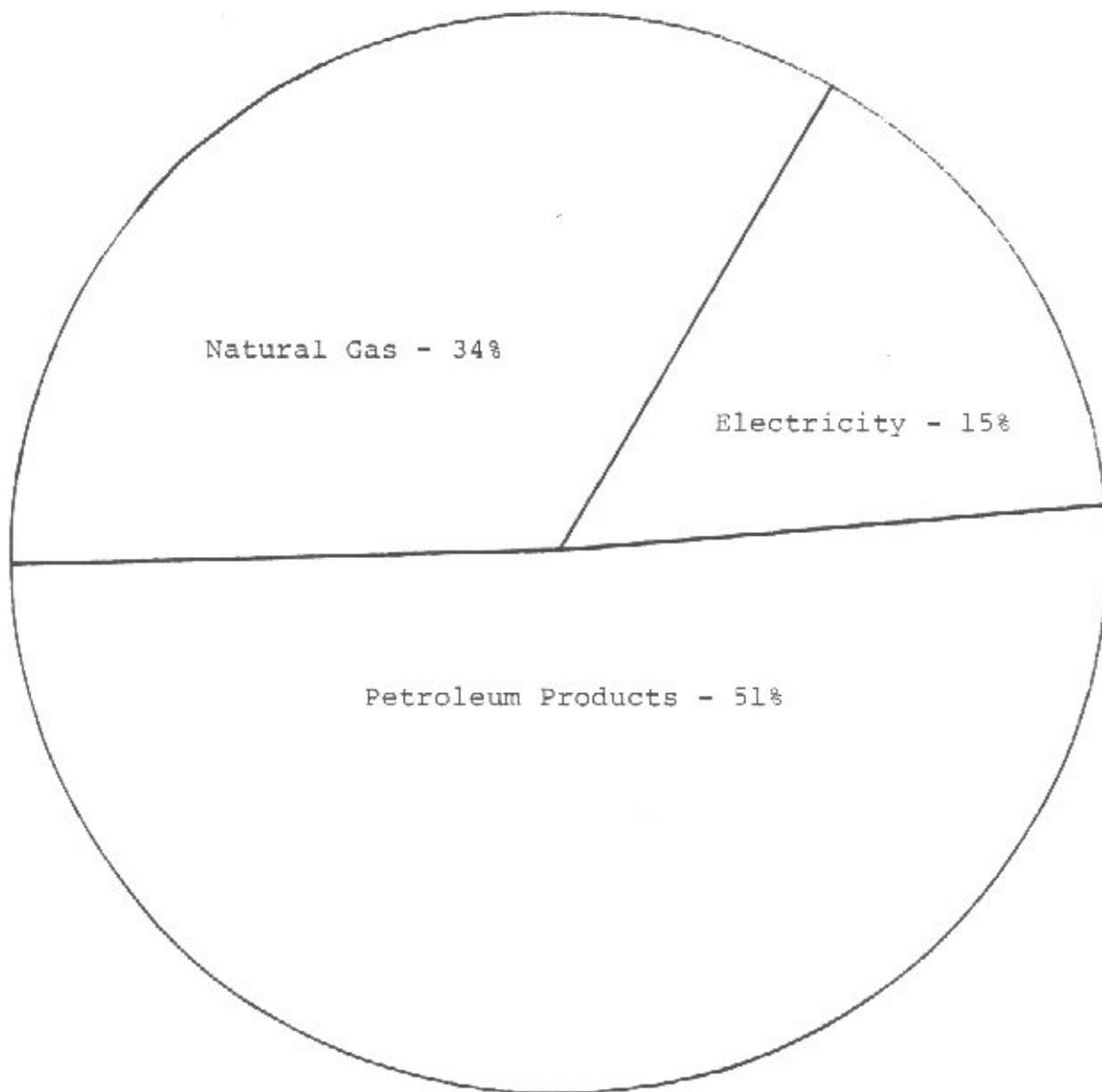
RETAIL ENERGY PURCHASES IN LEXINGTON BY SECTOR
AS A PERCENTAGE OF TOTAL BTU CONSUMPTION (1982)

FIGURE II

Transportation - 48%

Commercial/Industrial

24%
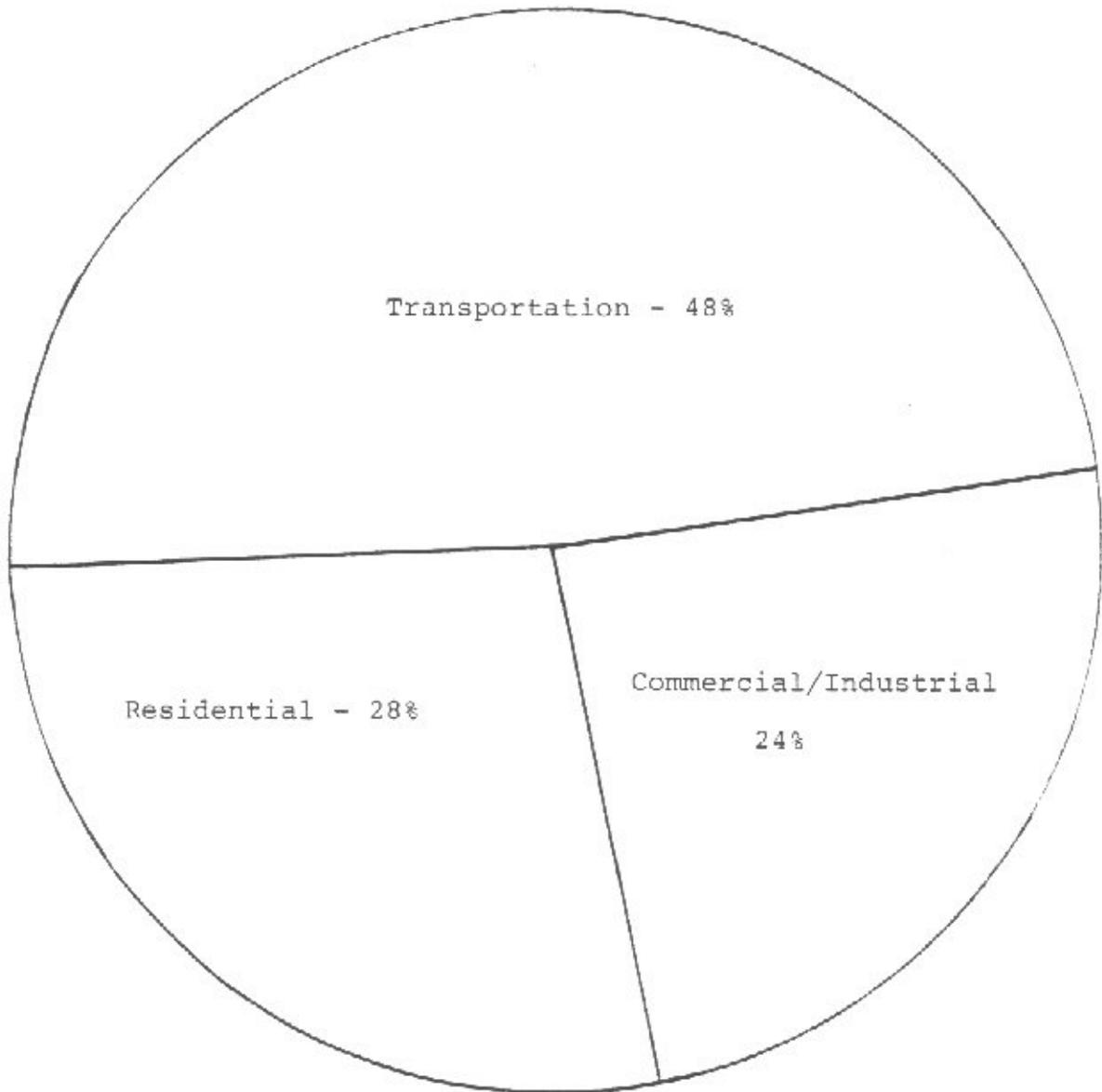
Residential - 28%

LEXINGTON RETAIL ENERGY PURCHASES BY FUEL TYPE
AS A PERCENTAGE OF TOTAL BTU CONSUMPTION (1982)

FIGURE III

Natural Gas - 34%

Electricity - 15%

Petroleum Products - 51%

END-USE SECTOR ANALYSIS

Residential

According to 1980 Census data and city utility data, there
are 2873 year-round residential dwelling units housing the 7,040
residents of Lexington. Of these approximately 60% were
constructed prior to 1960 and can be considered to have been
constructed below current energy standards. Because of market
demand and state adoption of minimal energy standards, most new
homes are insulated and more energy efficient than older
housing, although still more energy consuming than need be the
case if building designs approached the levels that are
technically feasible today. A majority of homes, 77.4%, are
air-conditioned, and there is a trend toward central units or
wholehouse conditioning.

Energy use in the residential sector can be divided into
four major categories: space heating, water heating, space
cooling, and other appliance use. In Nebraska, space heating
typically accounts for about 60% of the home energy bill.
Currently, approximately 76% of the local residential energy
needs are supplied by natural gas, 23% by electricity and the
remainder by propane or heating oil.

There is an enormous potential for reducing the space
heating requirements in residential buildings. For example, a
new 1,500 square foot home (typical of the new dwellings being
constructed now in Nebraska) can reduce its thermal needs by 60%
or more compared to pre-1978 units through improved building
design. A well-designed new home might be able to lower its
annual heating demand from 161,000 cubic feet of natural gas to
67,000; and a new home that incorporates either some carefully
designed solar or super-insulating features can cut that demand
even further, to as low as 13,000 cubic feet per year. By 1990
this might produce a savings of $600 to $900 a year to the
household in avoided heating bills.

A number of studies suggest that existing building stock can
improve its energy efficiency by 40% to 60%. However, it is
expected that without new programs to promote conservation in
the residential sector, overall consumption will increase
slightly as more homes are built. Their increased efficiency
will be offset by a move from the present 1300 square feet unit
to new homes averaging 1500 square feet or more. This may be
especially true in Lexington since the community has a higher
per capita income than the state as a whole ($9,268 for
Lexington versus $9,086 for Nebraska in 1980 dollars). This
usually translates into a parallel increase in energy
consumption.

FIGURE IV-1

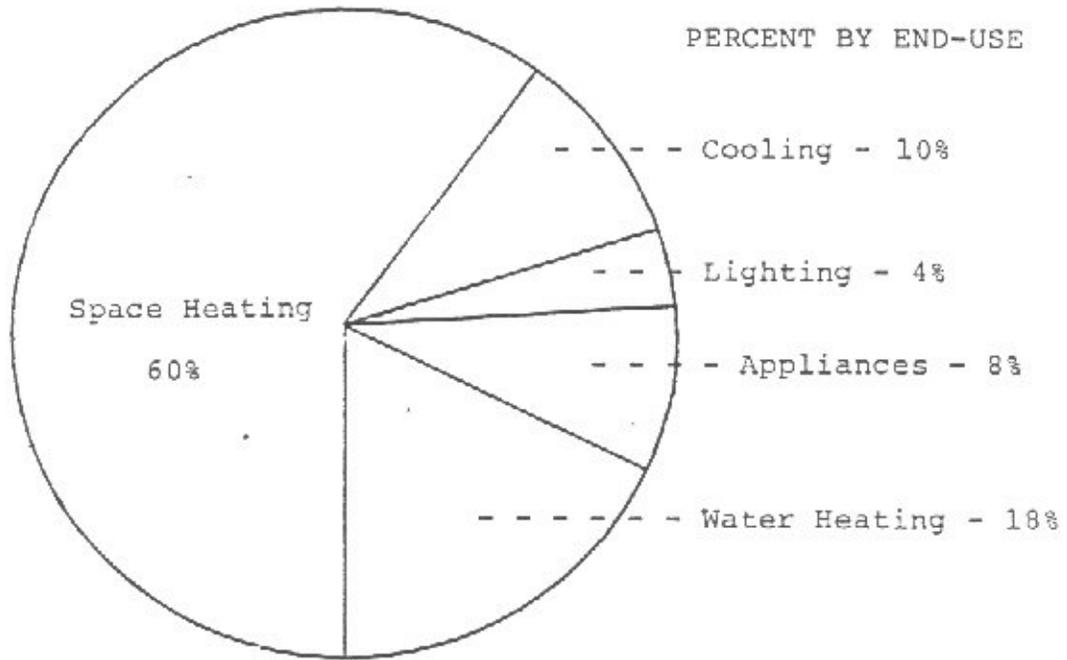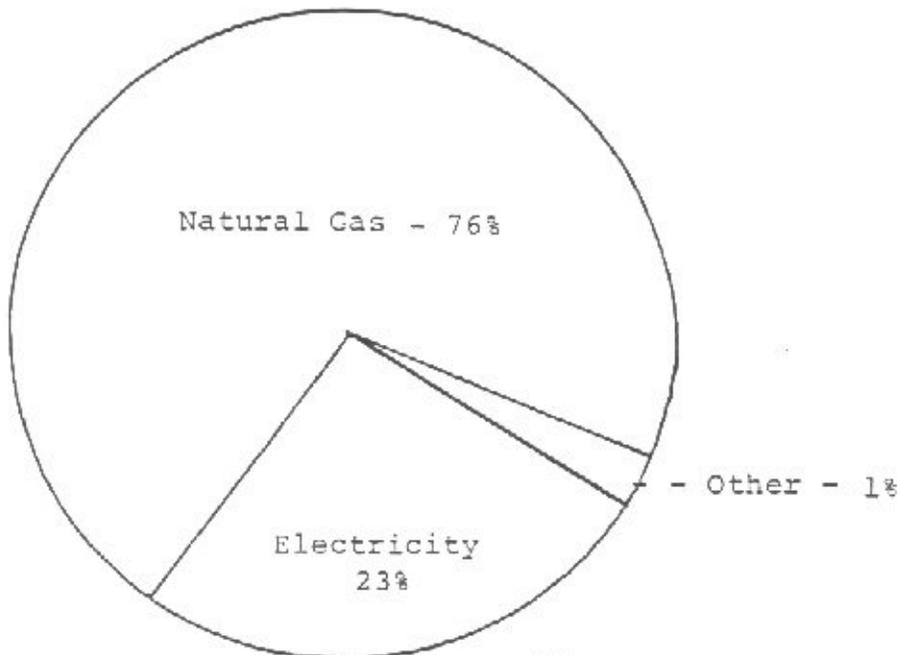TYPICAL END-USE RESIDENTIAL CONSUMPTION BY PERCENT IN NEBRASKA

PERCENT BY END-USE

Space Heating
60%

- - - - Cooling - 10%

- - - Lighting - 4%

- - - Appliances - 8%

- - - - - Water Heating - 18%

FIGURE IV-2

PERCENT OF TOTAL LEXINGTON RESIDENTIAL CONSUMPTION BY FUEL TYPE
(excluding transportation)

Natural Gas - 76%

- - Other - 1%

Electricity
23%

Commercial/Industrial

Because many industrial operations may be included in the commercial sector when compiling census, utility and other energy data in smaller communities, it is difficult to segregate industrial and commercial enterprises for Lexington without a thorough end-use survey. Moreover, U.S. Census data--the source of much of the information used in this report--tends to be less complete for communities with a population under 10,000 people. For these reasons the two sectors have been combined in this report.

Even with the combining of the two sectors, the total energy consumption identified tends to understate the impact of energy prices on the Lexington economy. For example, the only major industrial operation served by the local natural gas utility is located just outside the city limits. Finally, it should be noted that energy totals reported in this combined sector exclude transportation fuels which further understates energy use. One indication of this, as discussed in the transportation sector, is the fact that Dawson County has 60% more trucks per capita than does the state as a whole. This indicates a higher use of transportation fuels per unit of business activity in the county than in other parts of the state.

Lexington appears to have a fairly strong business sector, based upon Census data available for Dawson County. Per capita retail sales at the county level averaged less than at the state. But with the concentration of businesses in Lexington itself, this total approaches the state average of $5,220 annual retail sales per community resident. The commercial sector, including local government operations, employs about one of every four persons in the labor force. Thus, not only are the sales of goods and services affected by rising energy prices, but local employment opportunities are threatened as well.

Activity in the commercial sector takes place in a variety of settings such as stores, offices, hotels, theaters and restaurants. The needs for energy vary widely among these facilities, but they all have common requirements for heating and cooling of their interior space, lighting, and other requirements such as office equipment, cooking, elevators, computers and communications systems.

FIGURE V

ILLUSTRATION OF ENERGY CONSUMPTION IN A TYPICAL COMMERCIAL BUILDING
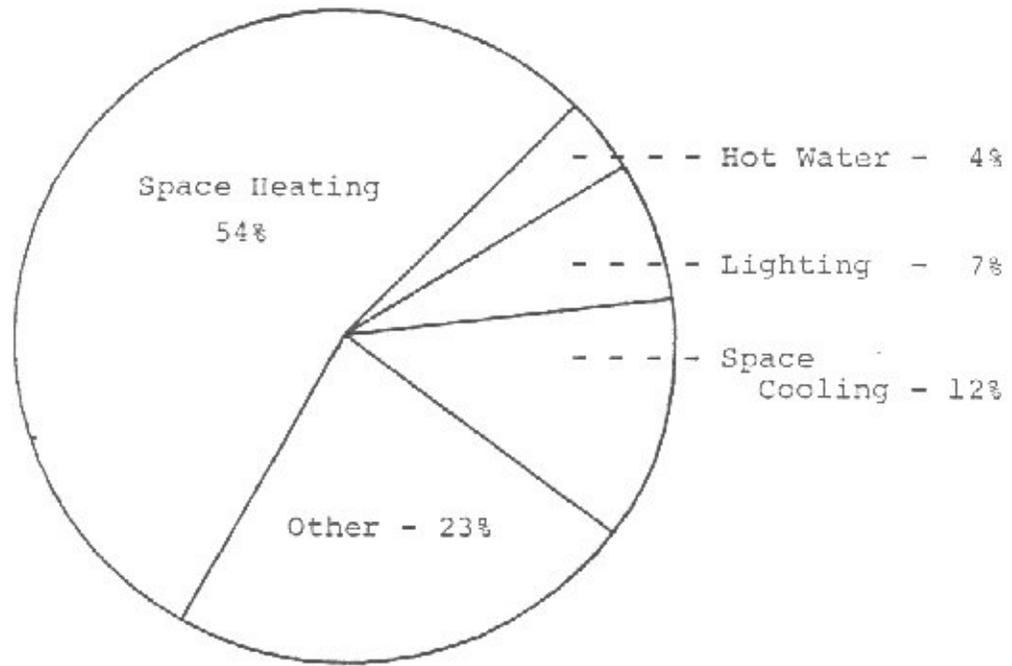
PERCENT BY END-USE

Space heating typically accounts for 54% of the total energy budget for the commercial sector; space cooling, 12%; lighting, 7%; water heating, 4%; and other uses mentioned above, 23%.

The primary energy sources used in the commercial sector are natural gas and electricity with some contributions from the middle distillates and propane. Use by fuel type for the commercial/industrial sector is presented in the pie chart in Figure VI.

The U.S. Department of Energy and the U.S. Department of Commerce estimate that savings of 20% to 50% in commercial buildings is possible. Many retail trade associations publish energy guide books that claim 10% to 30% energy savings if implemented. The Nebraska Commercial Conservation Program has found the greatest savings to businesses are achieved by simply properly operating and maintaining existing mechanical systems.

An estimate of industrial economic activity can be made by exploring the relationship of the value created within the manufacturing concerns as a ratio to population. "Value added" is the difference between the sale value of a finished manufactured product and the cost of materials, including energy expenses, that went into its production. Comparing Nebraska to Lexington and Dawson County, we find that on average the community is a heavily industrial one. The value added generated in Dawson County is estimated to be $3,996 per capita (in 1977 dollars), wnile the state averaged only $1,826 per capita. To illustrate the relationship between energy and manufacturing activity, it takes the energy equivalent of one gallon of gasoline for every $10-15 of value added generated in the state. Thus, as energy costs rise the productivity of local industries will be somewhat weakened.

In 1981 the Nebraska Energy Office, in cooperation with the Grand Island Chamber of Commerce, conducted team audits of twelve manufacturers. Every facility audited revealed the potential of at least 15% reduction in energy consumption through low cost/no cost recommendations. This is a strong indication that even with the significant conservation efforts undertaken by industry through 1980, more opportunities exist to reduce demand still further.

FIGURE VI

LEXINGTON COMMERCIAL/INDUSTRIAL CONSUMPTION

Natural Gas
51%

Other - 13%

Electricity - 36%
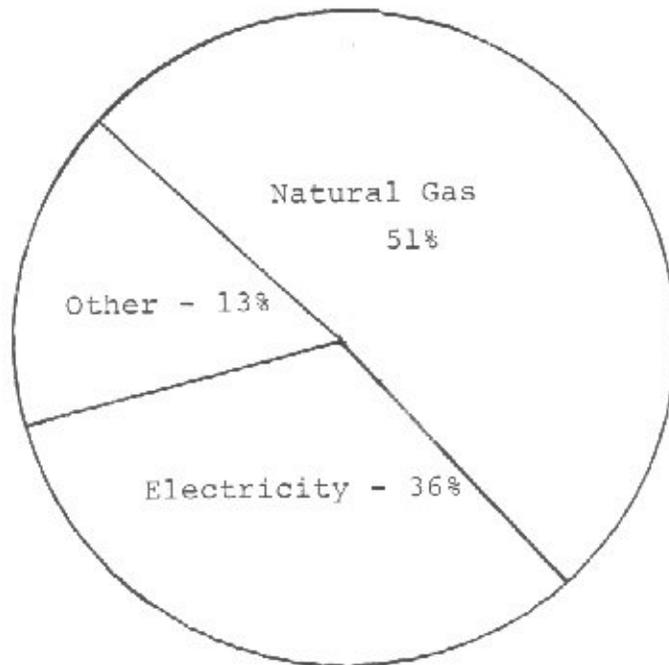
PERCENT OF FUEL TYPE

Transportation

Most energy for transportation is supplied by gasoline, oil, and diesel fuels. Supplemental amounts are provided by super-unleaded with ethanol (gasohol) and propane. Mileage driven in Nebraska peaked in 1978 and then decreased in 1979-80. Since 1981, mileage has again been gradually increasing although total fuel use continues to decline since improved efficiency in miles per gallon has more than offset any driving increases.

Lexington has an estimated 4,000 automobiles, about one for every 1.76 persons. This is 9% more than the state average. Added to the vehicle population is a significantly greater registration of trucks compared to the state as a whole, undoubtedly reflecting the higher level of agricultural and industrial activity. Based on Census data there are approximately 2600 trucks in the Lexington area, or one registered truck per 2.71 persons. That represents a concentration of trucks that is 60% more than the combined state average. The implication is clear, a higher vehicle population combined with higher per capita incomes results in a larger per capita consumption of transportation fuels in Lexington.

Although the use of transportation fuels is not something that is easily managed by a local community, incentives to increase the carpooling among people who commute to work can result in a large energy savings. Lexington commuters, according to the 1980 Census survey, average 1.15 persons per vehicle. Making some reasonable assumptions about distance traveled and overall fuel efficiencies of the cars, it appears that a minimum of 500,000 gallons of gasoline are used annually to transport people to work. If the ratio of people per vehicle were increased to as little as 1.5 persons, as much as 120,000 gallons of gasoline might be saved annually. Consumers would then have perhaps $150,000 in additional disposable income in the Lexington area.

Summary

Figure VII provides a summary comparison of per capita
energy consumption in Lexington with per capita consumption in
the state. Agricultural use of energy has been omitted from the
state total in order to give a more meaningful illustration
since there is very little, if any, energy directly consumed for
primary farm production within the city limits. Corrected in
this manner, it appears that Lexington is slightly less
energy-intensive than the state as a whole. As noted in the
next section, however, the community will be greatly affected by
rising energy prices nonetheless.

The residential sector is comparable with the state average
while, despite a higher industrial activity per capita in
Lexington, the community seems to use less energy within the
community/industrial sector. But this difference is likely
offset by the greater use of truck transportation by area
businesses, accounting for the larger per capita consumption of
transportation fuels. When these totals are added, Lexington
residential and business consumers use almost 185 million Btus
per capita, equivalent to 1477 gallons of gasoline for all end
uses annually.

According to data supplied by the Nebraska Energy Office,
the annual increase in energy consumption during the 1970's was
approximately 3%, down from the nearly 6% rate in the preceding
decade. After peaking in 1979, energy use in the state declined
about 5% in both 1980 and 1981; this was followed by a 4%
increase in 1982. The Energy Office estimates further increases
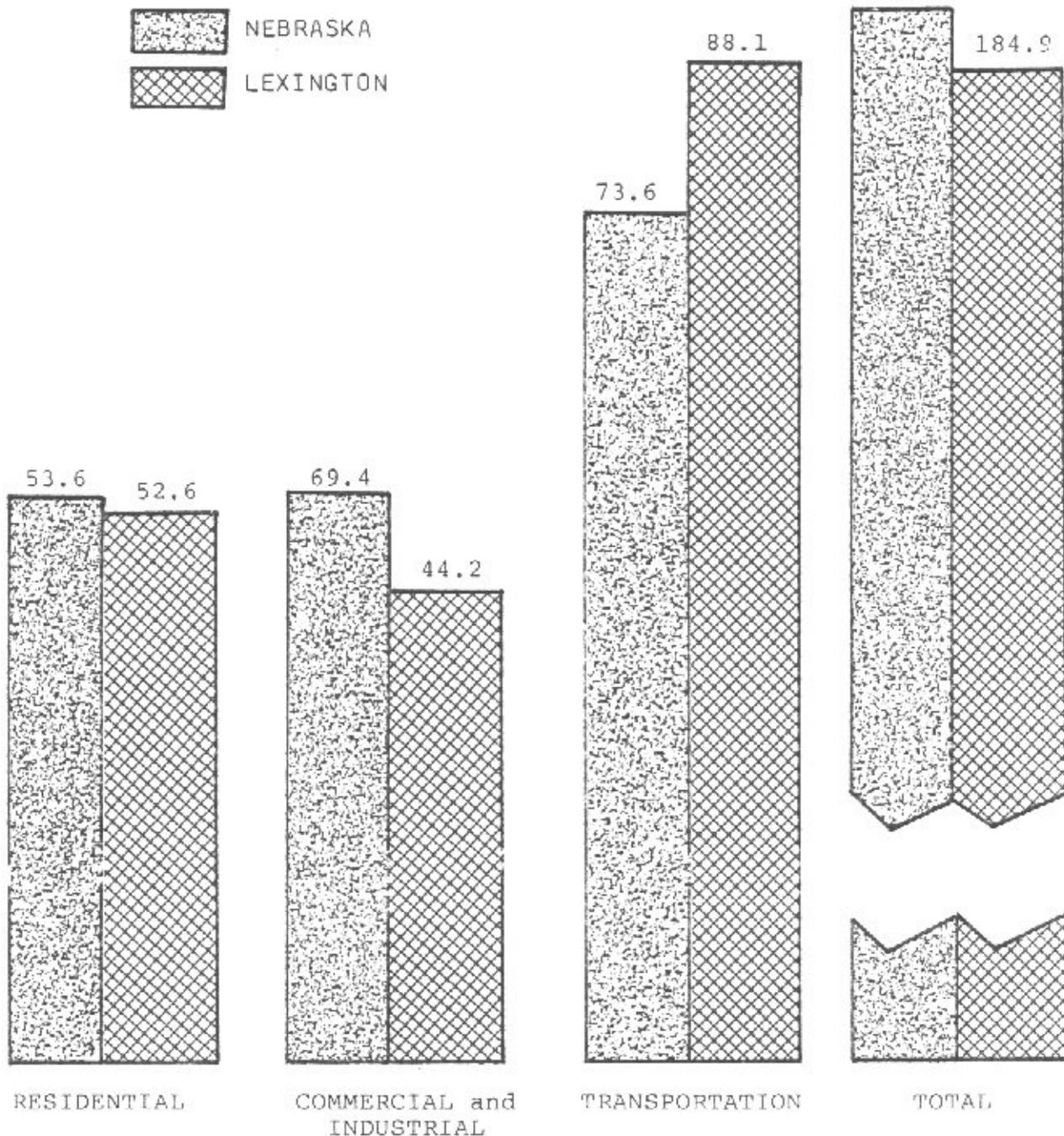will follow a more moderate course through 1990, a 1.5% annual
increase.

Given the similarity in energy intensity between Lexington
and the state, coupled with only a modest population growth of
only .4% per year for Dawson County, it seems reasonable to
expect that, absent any major conservation programs launched
within the community, the Lexington retail energy consumption is
likely to grow at that parallel rate.

FIGURE VII --

COMPARISON OF NEBRASKA AND LEXINGTON

PER CAPITA ENERGY CONSUMPTION BY SECTOR

(in million BTUs/person, excluding
 agricultural consumption)

NEBRASKA

LEXINGTON

53.6   52.6   69.4   73.6   88.1   196.6   184.9
                          44.2

RESIDENTIAL   COMMERCIAL and   TRANSPORTATION   TOTAL
                INDUSTRIAL

1990 ECONOMIC IMPACTS

In reviewing the future impacts of rising energy costs upon a local economy, there are several different perspectives we can explore. The first is to explore the costs to the average household for its direct consumption. The second is to evaluate the community's annual energy bill for all sectors in terms of Lexington's per capita incomes. The last approach is to look at how rising energy prices affect the local economy productivity.

To begin our analysis we need first to look at typical 1982 energy costs in Lexington. This is presented in Table C, both in dollars per conventional measure (e.g., gallons, MCF or thousand cubic feet, and kilowatt-hours) and in dollars per million Btu. This will allow a comparison of equivalent costs. It is interesting to note that our most expensive energy supply is electricity, approaching $16 per million Btu while natural gas is the least expensive at $3.62 per million Btus. However, because a typical household or business uses so much more natural gas in absolute terms, the bills tend to be comparable to those for electricity. The weighted average of all retail energy purchases in 1982 is listed at $8.52 per million Btus. Assuming a real price increase of only six percent per year, by 1990 the average price of energy can be expected to climb to $13.54 per million Btu (in 1982 dollars, effectively eliminating the impact of inflation). Many analysts believe this may prove to be a low estimate, projecting real price increases to average 10% or more on average. To the extent that this is the case, then our discussion here will tend to understate the costs of energy consumption.

The prices listed on Table C understate the cost to the residential consumer since, on average, residential electrical and natural gas rates are higher than for commercial and industrial customers. Table D identifies these costs in terms of the 1982 consumption of a typical Lexington household and projects the costs of a similar household in 1990, assuming 3-4 persons in each household.

Should this trend materialize, the implication is clear: even with a modest conservation effort the household energy costs will experience a 55% increase, rising from $2,064 in 1982 to as much as $3,200 in 1990.

But this information does not tell us about the household or individual share of industrial or commercial-governmental energy requirements. As previously noted, Lexington spends $11 million a year for all uses of energy. This represents a per capita

expenditure of $1,577. Since the 1982 estimated per capita
income approaches $9,900, it means that 16% of the Lexington
income must go to pay for energy consumption in one form or
another. If we assume that energy prices rise as little as 6%
per year after discounting for inflation, and if overall usage
increases by only 1.5% annually, by 1990 each of the 7,324
residents of Lexington (up from the present 7,040) will be
paying $2,717 to purchase the energy needed by the community.
Should real incomes rise by as much as 3% per year, the net
result will be that in eight short years, per capita energy
costs will jump to 22% of the personal income levels. This
point is illustrated in Figure VIII.

Having to spend more of our business and family budgets on
energy, by definition, implies there will be less money for
other goods and services. In short, the productivity of the
local economy will be weakened if Lexington cannot find a way to
stem the flow of energy dollars. While these numbers are not
absolute forecasts of the future, they do underscore a central
theme of this report: increasing energy costs will be a major
factor in determining the quality of future economic
development.

Another measure of productivity is to compare the economic
benefits that result from spending a dollar on one commodity
compared to another. As Table E illustrates, under optimum
circumstances, a one dollar expenditure for conventional energy
yields a "multiplied" economic benefit of only $.70 for a state
such as Nebraska. This figure reflects a composite of
electricity, natural gas and oil expenditures and it reflects
the fact that when money is spent for a commodity such as
energy, the effect is to generate business activity and tax
revenues that, in turn, create a demand for additional
manufacturing and employment that will ripple through the
economy and multiply the value of the original expenditure.

In the case of most conservation and normal consumer
purchases, a one dollar expenditure under optimum conditions can
yield as much as $2.20 in net multiplied benefits to the state.
Thus, for each dollar that can be diverted from conventional
energy supplies in a cost-effective fashion, the local economy
can gain as much as $1.50, essentially the difference between a
multiplier of $2.20 rather than $0.70. With this perspective in
mind, then, we can now take a look at the impact of future
energy bills on the Lexington economy by comparing a moderately
aggressive conservation effort within the community to a
"business-as-usual" approach to energy matters.

TABLE C

TYPICAL 1982 RETAIL ENERGY PRICES IN LEXINGTON

Fuel Source	$/Unit	$/Million Btu
Gasoline	$1.22/gallon	$ 9.76/mmBtu
Natural Gas	$3.60/MCF	$ 3.62/mmBtu
Electricity	$ .054 kwh	$15.82/mmBtu
1982 average energy price for all sources:		$ 8.52/mmBtu

Projected 1990 average energy price for
  all sources (in 1982 dollars): $13.54/mmBtu

TABLE D

ILLUSTRATION OF AVERAGE HOUSEHOLD ENERGY COSTS - LEXINGTON

1982

```
electricity   -  6500 kwh at $.07/kwh           = $   455
natural gas   -  120 MCF at $3.75/MCF           = $   450
gasoline      -  950 gallons at $1.22/galllon   = $1,159

                              Annual Total:       $2,064
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1990

```
electricity   -  6000 kwh at $.082/kwh          = $   480
natural gas   -  90 MCF at $8.50/MCF            = $   765
gasoline      -  850 gallons at $2.30/gallon    = $1,955

                              Annual Total:       $3,200
```

FIGURE VIII

ENERGY COSTS AS A PERCENTAGE OF PERSONAL INCOME - LEXINGTON

(1982 dollars)

1982 $1577 (per capita energy costs) - 16% of income

$9,900 per capita income

1990 $2717 (per capita energy costs) - 22% of income
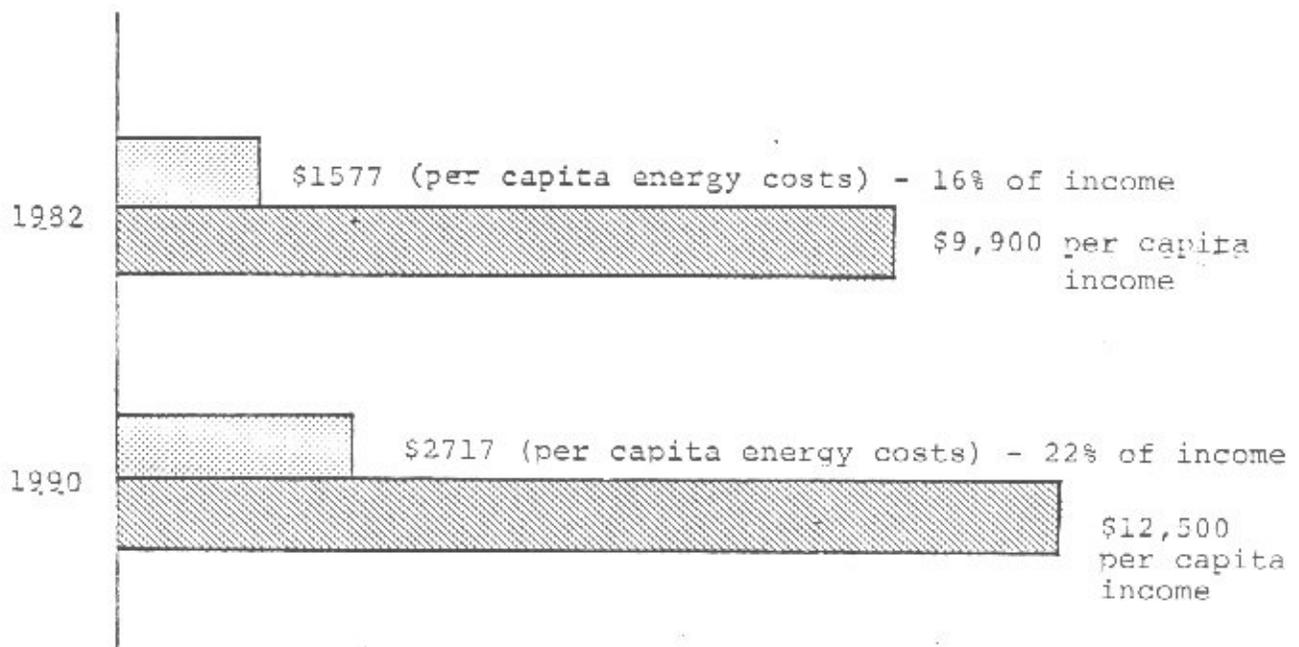
$12,500 per capita income

TABLE E

ESTIMATED LONG TERM NET ECONOMIC EFFECTS

OF A ONE DOLLAR PURCHASE OF CONVENTIONAL ENERGY SUPPLIES

VERSUS

CONSERVATION OR NORMAL CONSUMER PURCHASES

Purchase	Economic Multiplier	Money Exported From State	Net Economic Impact
Conventional Energy Supplies	1.50	.80	.70
Conservation or normal consumer expenditures	2.55	.35	2.20

Under a business-as-usual scenario, the energy consumption can be expected to increase almost 13% or more, through 1990, depending upon how strong the economic recovery proves to be.

Anticipating the kind of higher energy prices projected in Table C, the total energy bill for the Lexington community can be expected to increase from $11.08 million to $19.90 million by 1990. Recalling that each dollar diverted from other sectors to pay for a higher energy bill "costs" the economy about $1.50 in lowered productivity, an $8.82 million increase in the overall energy bill implies that Lexington will experience as much as $13.23 million less as part of its share of the Gross State Product than if the energy bill remained at the 1982 level. (See Table F, column 2).

Pursuing a conservation or an energy management scenario, one that takes advantages of improvements in energy efficiency as discussed earlier in the report, it is possible to reduce the projected 1990 consumption to 85% of the baseline scenario, or down to 1.25 trillion Btus from the projected 1.30 trillion Btus under the business-as-usual scenario. This lowered demand could result in a reduced annual expenditure compared even to the 1982 total.

Again referencing a positive multiplier effect by diverting money away from conventional energy expenditures, the conservation scenario can generate an increase in local economic activity of $8.91 million compared to the business-as-usual approach. This point again suggests that energy conservation strategies can become a major source of local economic redevelopment programs for Lexington.

# # # # #

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TABLE F

ECONOMIC CONTRAST BETWEEN

BUSINESS AS USUAL AND CONSERVATION SCENARIOS

IN LEXINGTON, NEBRASKA

Business-As-Usual			Conservation	
Consumption (trillion BTUs)		Costs (million 1982 $)	Consumption (trillion BTUs)	Costs (million 1982 $)
1982	1.30	11.08	1.30	11.08
1990	1.47	19.90	1.25	16.93
Net increase in 1990 energy bill		8.82		5.85
Loss to economy as a result of expenditures in excess of 1982 costs		-13.23		-4.32
			Gain to economy as a result of 1990 conservation compared to 1990 business-as-usual scenario.	+8.91