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# Ravenna Energy Study 1984



STATE OF NEBRASKA

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## PREFACE

The Nebraska Energy Office is committed to assisting local communities plan 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 Nebraskans along their way towards energy independence.

During 1983, the Nebraska Energy Office worked in Fremont, Lexington and Bayard to develop the Nebraska Community Energy Management Program. In 1984, Governor Kerrey announced the competition and seven more communities were selected to participate in the program. Those communities are: Allen, Burwell, Ravenna, Schuyler, South Sioux City, West Point, and Wood River.

This community energy planning and action program starts with a Community Specialist working with local people to form an Energy Committee. The Nebraska Energy Office then returns a report to those people on how energy is used in their area and what that use means to the local economy. In a subsequent town energy meeting, the Energy Office provides an opportunity for people to take the facts and make decisions about better ways to use energy in their own community. An energy management action plan is developed and the Energy Office stands by the community to help turn their decisions into reality. Then state government will get out, expecting that it has left behind information, resources and leaders who understand how energy works as an economic part of the community. It also leaves a successful project that will inspire more local initiatives to realize even more community benefits.

This Energy Study was prepared by the Nebraska Energy Office with information provided by the Ravenna Energy Committee.

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

Catherine Adam  
Clarence Fisher  
James Frye  
Archie Kneeland

Larry McMaster  
Rev. Mike McMurtry  
Camie Pohlmann  
Jane Shrader

--January 5, 1985

## EXECUTIVE SUMMARY

Energy is essential for a healthy economy, but higher prices for energy resources can spell trouble for communities such as yours. 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 percent 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. Eighty percent 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 State Revenue 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.

Ravenna is a particularly energy-intensive community compared to other parts of the country; and as such the impact of rising energy prices will be significant. It is estimated that the 1,300 people living in Ravenna consumed a total of 35 billion Btus in 1983. This is approximately 271 million Btus for each man, woman and child in the town. This total includes energy purchased for transportation, business, and 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 2,168 gallons of gasoline to maintain the 1983 standard of living in the community. The total energy bill for Ravenna is pegged at \$2.6 million, most of which is transferred out of state 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 six 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 the year 2000 local businesses and residents would be paying \$6.5 million for energy under a "business-as-usual" scenario. As measured in 1983 dollars, this would result in a \$2.4 million decrease in the community's overall economic activity. Improved efficiency in energy use could offset the effect of higher prices 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 Ravenna, it helps to develop a framework for the reader. This discussion, then, begins with a brief look at the Nebraska energy situation. As Chart I illustrates, the state purchases about five percent less retail energy per capita than neighboring Iowa and approximately one percent less than the United States as a whole. Table A provides a snapshot of where Nebraska uses its energy and in what form the energy is supplied to the state's ultimate users.

In reviewing Table A, 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 35 percent 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 as the United States.

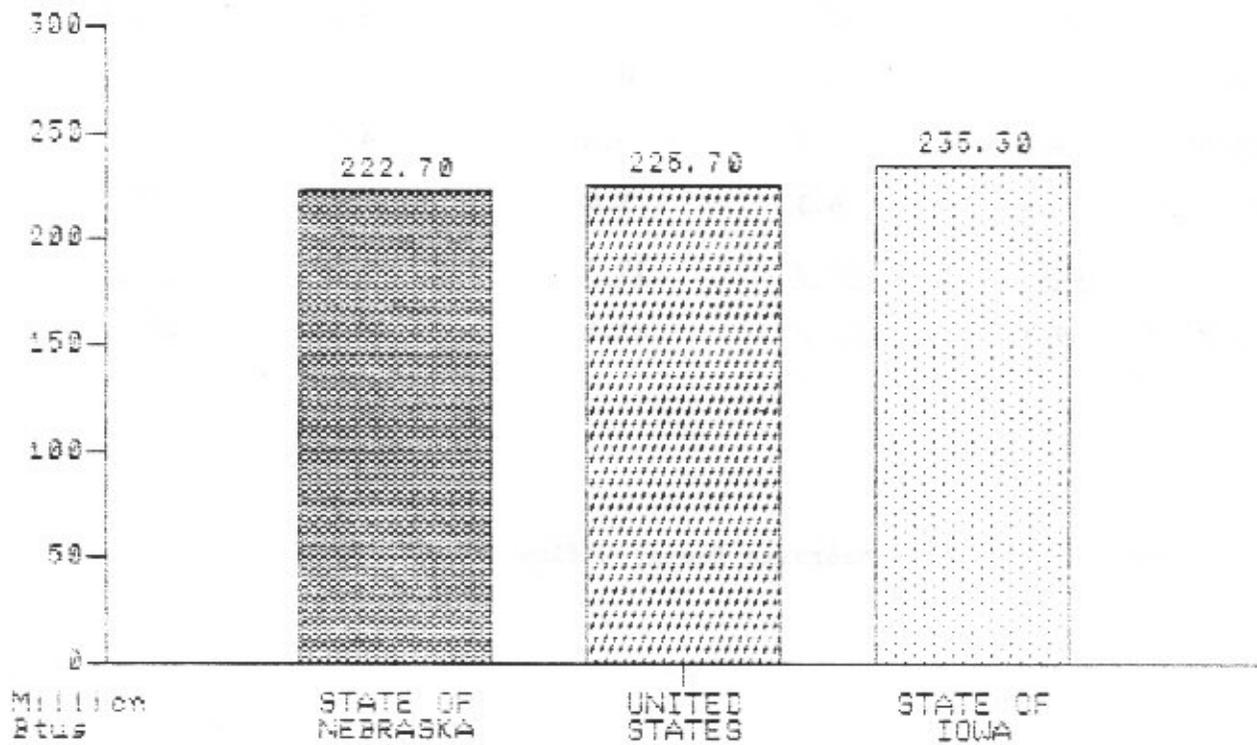
As further noted in Table A, retail sales of energy in Nebraska consist mainly of natural gas, gasoline, distillate fuels such as home heating oil and diesel fuel, and electricity. Refined petroleum products are the single largest contributor of energy consumed in Nebraska and accounted for 49 percent of the end-use energy consumed in the state in 1983. Natural gas was the second largest source of energy, comprising 34 percent of the total energy consumed, and electricity was the third largest energy source, providing approximately 14 percent of the 1983 demand for energy.

Only small amounts of the above 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 1983 alternatives such as solar, wind, biomass and alcohol fuels provided less than one percent of the energy consumed in the state. Among these alternatives, the ethanol portion of gasohol accounted for approximately one percent of the fuel used by motor vehicles.

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

CHART 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, (1983).

TABLE A

COMPARISON OF NEBRASKA END USE  
ENERGY CONSUMPTION BY SECTOR AND FUEL TYPE

(in 1983, trillion BTUs)

	<u>Residential</u>	<u>Commercial</u>	<u>Industrial</u>	<u>Agricultural</u>	<u>Transportation</u>	<u>Total</u>
Coal	0	0	7.8	0	0	7.8
Natural Gas	40.8	33.4	37.7	9.2	0	121.1
Gasoline	0	0	0	4.0	92.1	96.1
Aviation Fuel	0	0	0	0	4.5	4.5
Propane LP	4.6	3.1	0.8	4.9	0	13.4
Distillates	1.8	6.3	5.4	21.4	26.7	61.6
Electricity	<u>22.1</u>	<u>14.0</u>	<u>10.7</u>	<u>4.3</u>	<u>0.</u>	<u>51.1</u>
End-use Total	69.3	56.8	62.4	43.8	123.3	355.6

Source: 1983 Annual Report, Nebraska Energy Office

TABLE B

Ravenna

1983 RETAIL ENERGY PURCHASES BY SECTOR

(in billion Btus)

Residential	82.0
Commercial	87.2
Industrial	69.1
Transportation	<u>112.5</u>
TOTAL	350.8

Estimated 1983 Ravenna Energy Bill: \$2.61 million

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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 RAVENNA

When we speak of an energy profile for Ravenna, Nebraska, we are referring to the amount of energy purchased by end-users who live or do business within the city limits. However, since many energy transactions and users are not strictly confined to the community -- 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 keep in mind is that this 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 Ravenna and Buffalo 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, the methodology used to generate this profile provides a sufficient statistical base to illustrate the adverse economic impacts resulting from a "business-as-usual" approach to energy consumption, and to conclude that there is a major opportunity to bolster the economic well-being of the community through an energy management program.

In 1983, Ravenna energy consumption was approximately 351 billion Btus. To provide a more meaningful illustration, we can put this number in the context of how much equivalent gasoline it represents for each of the 1,300 residents. Since one billion Btus is comparable to the energy contained in about eight thousand gallons of gasoline, we might say that local residents and businesses consumed the equivalent of 2.8 million gallons of gasoline for all 1983 end-use energy needs -- approximately 2,168 gallons per person. The total energy bill for the community is pegged at \$2.61 million in 1983, about \$2,007 per capita.

As the pie charts indicate (Charts II and III), the transportation sector is the most energy-intensive area of the local economy. This is consistent with the state profile.

Natural gas is the community's most used energy resource, providing about 55 percent of total energy needs when calculated on an equivalent Btu basis. Following natural gas usage, petroleum provides 32 percent and electricity 13 percent of the energy use. In terms of actual consumption measures, these percentages are broken down into the following estimated annual purchases:

* Natural gas	202,535 thousand cubic feet (MCF)
* Transportation Fuel	900,000 gallons
* Electricity	13,460,378 kilowatt-hours

To better understand how energy use affects the local economy such as Ravenna; it is helpful to break the consumption pattern into a sector-by-sector analysis.

CHART II

RETAIL ENERGY PURCHASES IN RAVENNA BY SECTOR  
AS A PERCENTAGE OF TOTAL BTU CONSUMPTION (1983)

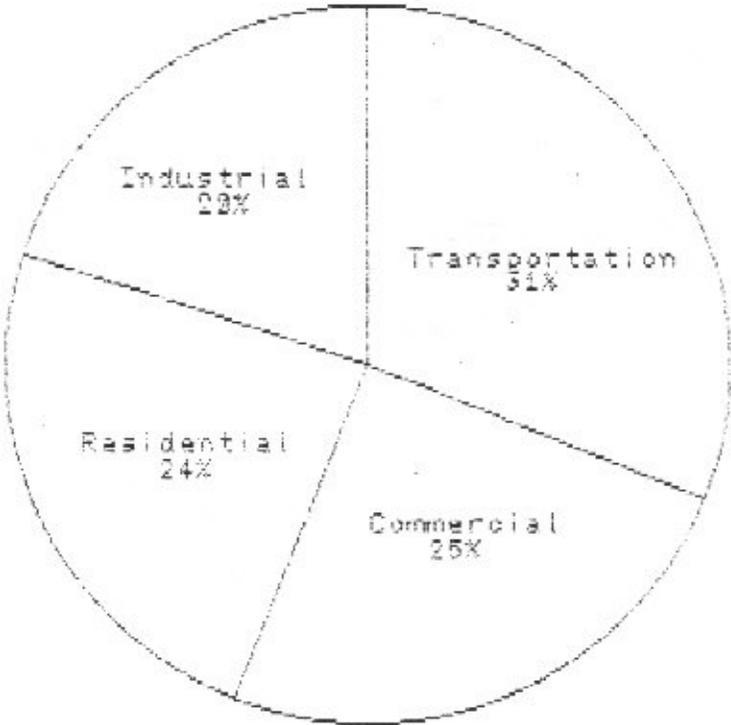
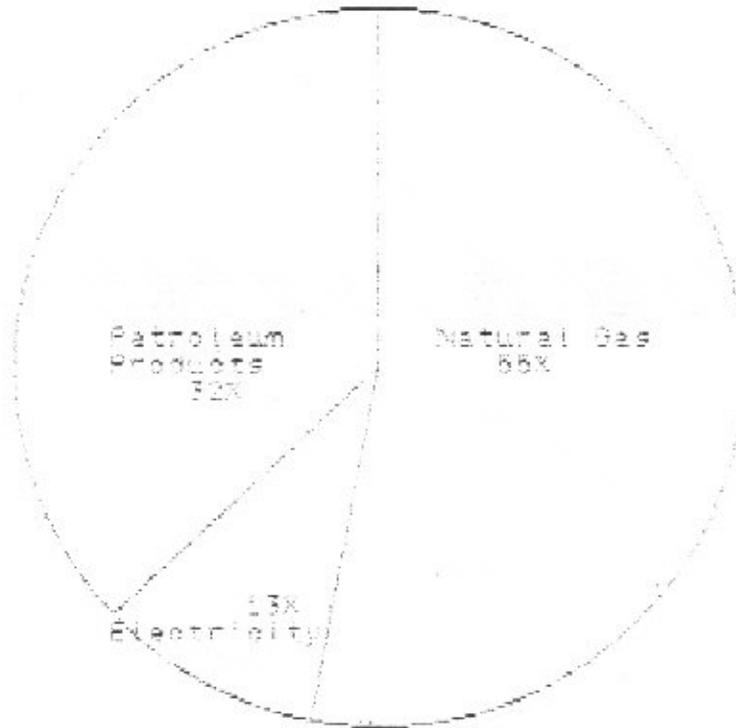


CHART III

RAVENNA RETAIL ENERGY PURCHASES BY FUEL TYPE  
AS A PERCENTAGE OF TOTAL BTU CONSUMPTION (1983)



## Residential Use

There are about 630 year-round residential dwelling units which house the 1,300 residents of Ravenna. Of these, more than 60 percent 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 are air-conditioned, and there is a trend toward central units or wholehouse conditioning.

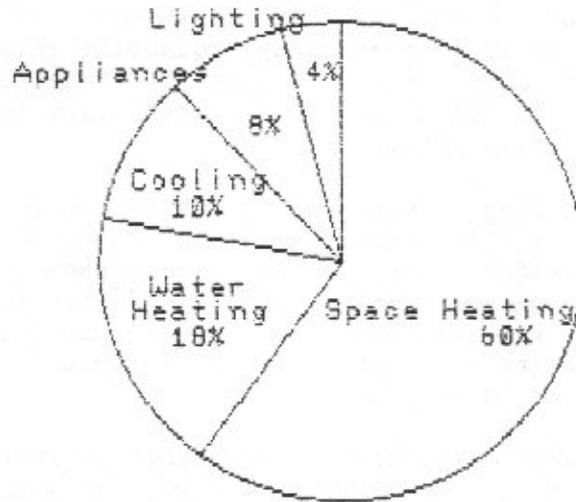
As shown in Chart IV-1, energy use in the residential sector can be divided into four major categories: space heating, water heating, space cooling, and other appliance use. In Nebraska, space heating typically accounts for about 60 percent or more of the home energy bill. Currently, as illustrated by Chart IV-2, approximately 77 percent of the local residential energy needs are supplied by natural gas, 22 percent 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 percent 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; 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 the year 2000, such a household might save \$1,200 to \$1,800 a year in avoided heating bills.

A number of studies suggest that existing building stock can improve its energy efficiency by 40 percent to 60 percent. 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.

CHART IV-1

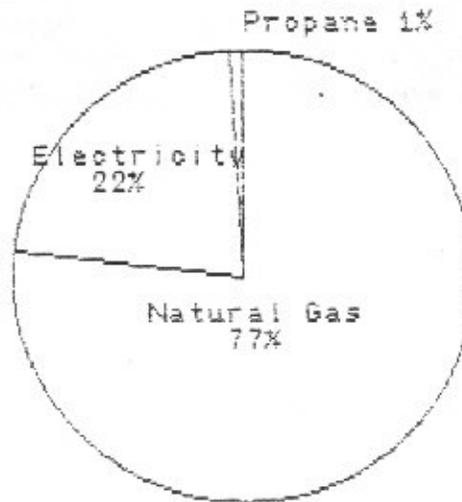
TYPICAL END-USE RESIDENTIAL CONSUMPTION BY PERCENT IN NEBRASKA



PERCENT BY END USE

CHART IV-2

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



## Commercial/Industrial Use

Because many industrial operations may be included in the commercial sector when census, utility and other energy data is compiled for smaller communities, it is difficult to segregate industrial and commercial enterprises for Ravenna without a thorough end-use survey. Moreover, U.S. Census data 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.

Ravenna appears to enjoy a level of business activity that is higher than the state average based upon Census data available for Buffalo County and gas/electric utility sales data. Per capita retail sales is 10% higher than the state as a whole, about \$5,700 per resident in the county compared to the Nebraska average of \$5,220. The level of manufacturing activity, based upon 1977 Census data, is also above the state average. In the county approximately \$2,240 of value-added production is generated per person while the average for the state is only \$1,826 per capita. The higher level of activity helps explain the level of business energy use that is 58% higher in Ravenna than in Nebraska. Thus, energy costs are a significant force in determining the productivity of the commercial/industrial sector.

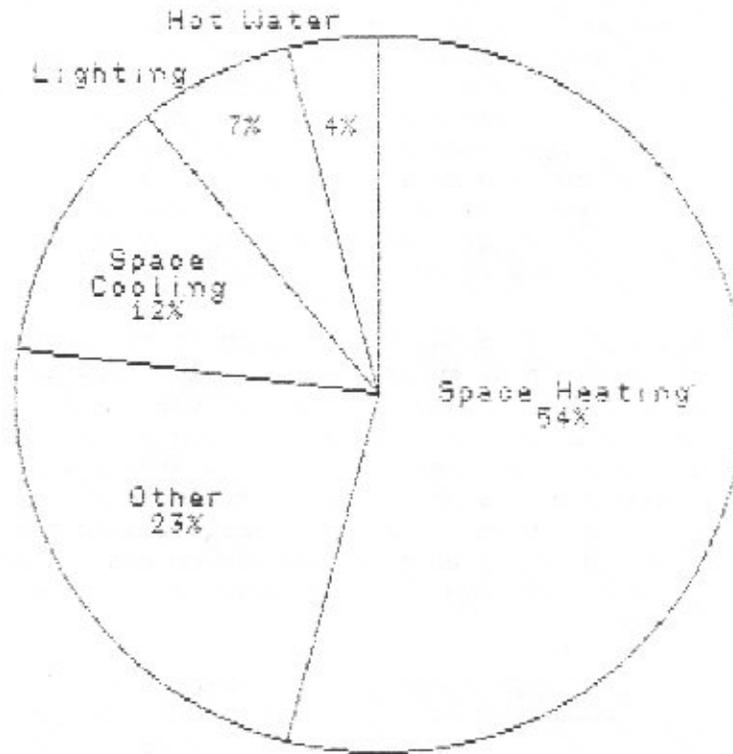
We can illustrate the importance of energy in the manufacturing sector by discussing the relationship of energy to the value of products created by industrial activity. "Value added" is the difference between the costs of materials and labor that went into the production of an item, and the sale price of the finished manufactured product. In Nebraska it takes the energy equivalent of one gallon of gasoline for every \$4.50 of value added (1977 dollars) generated in the state, thus, as energy prices rise, manufacturing productivity will be weakened, because the higher cost of energy, which is a factor in the production process, will decrease the value added gained by Nebraska manufacturers.

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

Activity in the commercial sector, including local government operations, 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, lighting, and other requirements such as office equipment, cooking, elevators, computers and communications systems.

CHART V

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



PERCENT BY END-USE

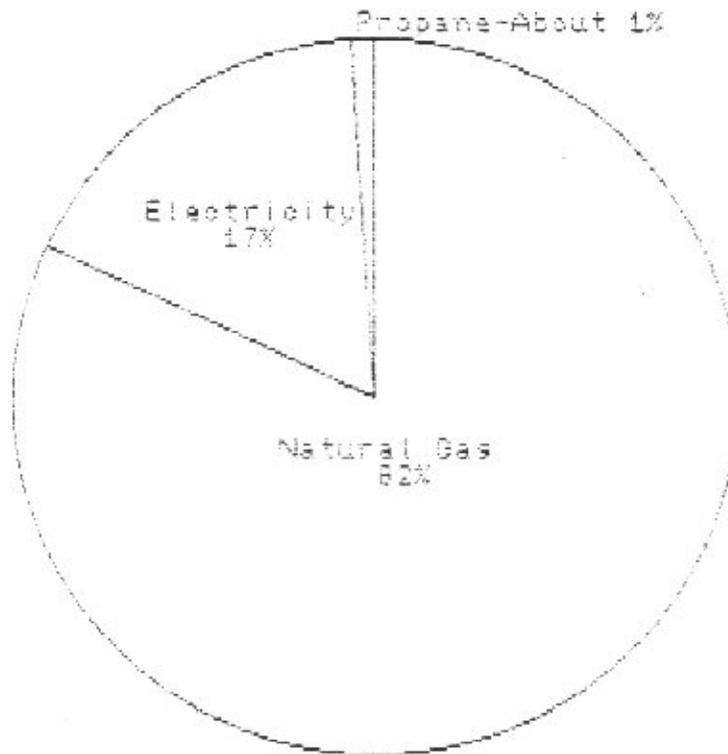
Space heating typically accounts for 54 percent of the total energy budget for the commercial sector; space cooling, 12 percent; lighting, 7 percent; water heating, 4 percent; and other uses mentioned above, 23 percent.

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 Chart VI.

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

CHART VI

RAVENNA COMMERCIAL/INDUSTRIAL CONSUMPTION



PERCENT OF FUEL TYPE

## Transportation Use

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.

Ravenna has an estimated 1,223 vehicles, about .94 registered trucks and cars for every resident. This is twenty percent more than the state average. A larger per capita vehicle population results in a larger per capita consumption of transportation fuels, approximately 14% more than the state average (excluding aviation fuels).

Transportation fuels represent approximately 32 percent of the overall energy consumed in Ravenna. Because of the higher costs of gasoline compared to other fuels, however, transportation fuels account for 43 percent of the total cost of energy purchased by Ravenna residents and businesses in 1983. Reducing gasoline or diesel fuel consumption by only 5 percent in 1983 would have increased personal disposable income by \$60,000. This would have generated a sizeable stimulus for the local community.

## SUMMARY

Chart VII provides a summary comparison of per capita energy consumption in Ravenna with per capita consumption in the state. Since there is very little, if any, energy directly consumed for primary farm production within the city limits, agricultural use of energy has been omitted from the state total. Corrected in this manner, it appears that the community is 36% more energy-intensive than the state as a whole.

When totaled, local residential and business consumers use more than 271 million Btus per capita, equivalent to 2,168 gallons of gasoline for all end uses annually.

According to Nebraska Energy Office data, the annual increase in energy consumption during the 1970's was approximately three percent, down from the nearly six percent rate in the preceding decade. After peaking in 1979, energy use in the state declined about five percent in both 1980 and 1981. But then it increased four percent in 1982. The Energy Office estimates further increases will follow a more moderate course through the year 2000, largely depending upon population increases and economic conditions.

Given present levels of price increases, we can expect that, absent any major community conservation programs, the local retail energy consumption will increase at a rate that tracks population increases--about 0.6 percent annually. As noted in the following section, Ravenna will be greatly affected by any increase in its annual energy expenditures.

CHART VII

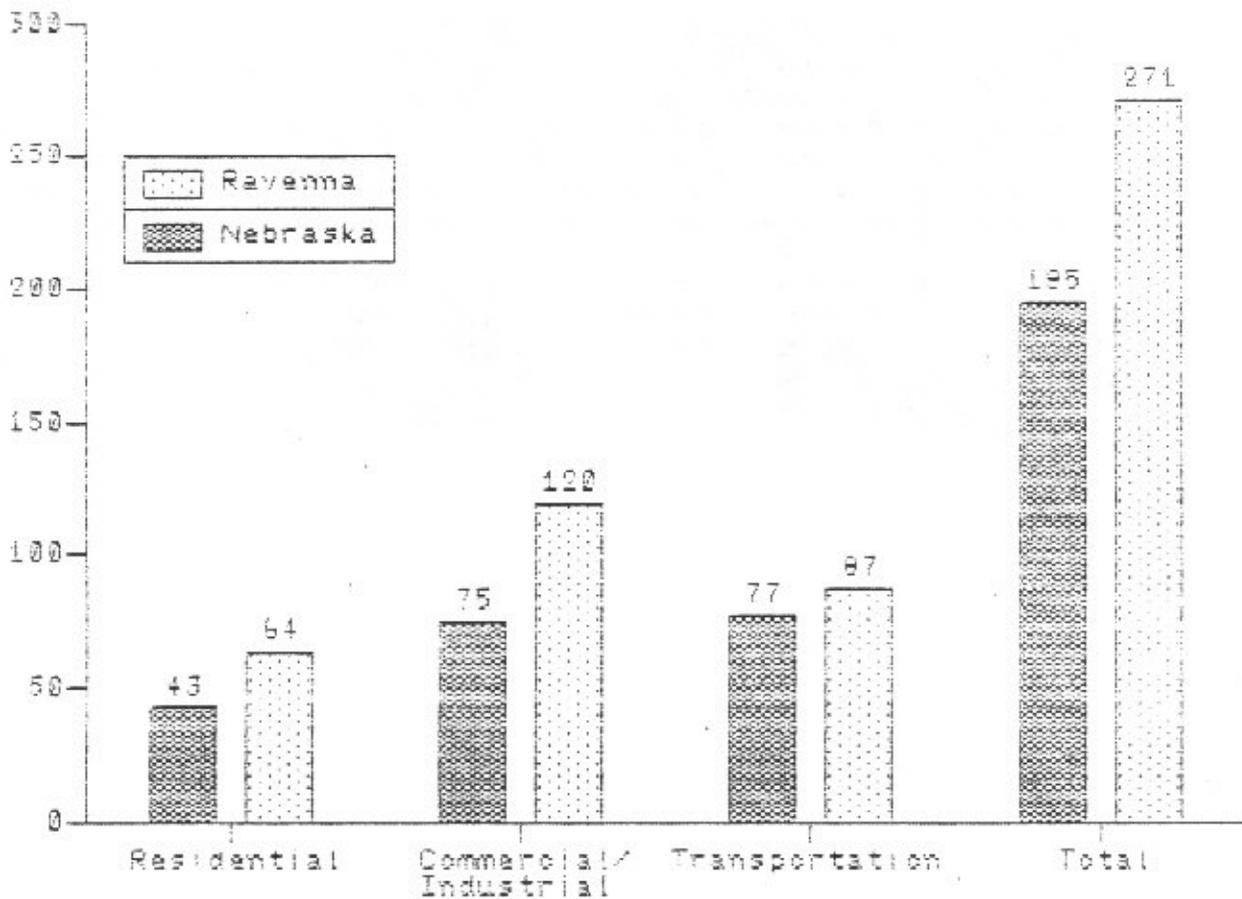
COMPARISON OF NEBRASKA AND RAVENNA

PER CAPITA ENERGY CONSUMPTION BY SECTOR

(in million BTUs/person, excluding agricultural consumption)

NEBRASKA

RAVENNA



## ECONOMIC IMPACTS--THE YEAR 2000

Several factors should be explored in a review of the future impacts of rising energy costs upon a local economy. 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 local per capita incomes. The last approach is to look at how rising energy prices affect the local economy's productivity.

To begin our analysis we need to look at typical 1983 energy costs in the community. 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, almost \$17 per million Btus while natural gas is the least expensive at \$3.75 per million Btus. However, because a typical household or business uses so much more natural gas in absolute terms, the bills tend to be larger than those for electricity. The weighted average of all retail energy purchases in 1983 is listed at \$7.44 per million Btus. Assuming a real price increase of only five percent per year, by 2000 the average price of energy can be expected to climb to \$17.04 per million Btus (in 1983 dollars, effectively eliminating the impact of inflation).

The average prices listed in Table C understate the cost to the residential consumer since, typically, residential electrical and natural gas rates are higher than commercial and industrial rates. Table D identifies these costs in terms of the 1983 consumption of a typical Ravenna household and projects the costs of a similar household in the year 2000, assuming 3-4 persons in each household.

Should this trend materialize, the implication is clear: Even with a modest conservation effort individual household energy costs will experience a 43 percent increase, rising from \$1,958 in 1983 to as much as \$2,809 in the year 2000.

But this information does not tell us about the household or individual share of industrial or commercial-governmental energy requirements. As previously noted, Ravenna spends \$2.61 million a year for all uses of energy. This represents a per capita expenditure of \$2,007. Since the 1983 estimated per capita income approaches \$9,100, 22 percent of the Ravenna income must go to pay for energy consumption in one form or another. If we assume, after discounting for inflation, that energy prices rise as little as five percent per year, and if overall usage increases by less than 1.0 percent annually (essentially tracking population increases), by the year 2000 each of the 1,400 residents of Ravenna (up from the present 1,300) will be paying \$4,600 to purchase the energy needed by the community. Should real incomes rise by as much as three percent per year, the net result will be that in 17 short years, per capita energy costs will jump to 31 percent of the personal income levels. This point is illustrated in Chart VIII.

Spending more of our business and family budgets on energy means there will be less money for other goods and services. In short, the productivity of the local economy will be weakened if Ravenna 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 determine 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 1.45 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 2.06 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 \$0.61, or the difference between a multiplier of 2.06 and a multiplier of 1.45. With this perspective in mind, then, we can consider the impact of future energy bills on the local economy by comparing a moderately aggressive conservation effort within the community to a "business-as-usual" approach to energy matters.

TABLE C  
AVERAGE 1983 RETAIL ENERGY PRICES IN RAVENNA

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<u>Fuel Source</u>	<u>\$/Unit</u>	<u>\$/Million Btu</u>
Gasoline	\$1.25/gallon	\$10.00/mmBtu
Natural Gas	\$3.56/MCF	\$ 3.75/mmBtu
Electricity	\$ .057 kwh	\$16.70/mmBtu
1983 average energy price for all sources:		\$ 7.44/mmBtu

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Projected year 2000 average energy price for  
all sources (in 1983 dollars) at a weighted  
5 percent increase per year: \$17.04/mmBtu

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TABLE D

ILLUSTRATION OF AVERAGE HOUSEHOLD ENERGY COSTS - RAVENNA

1983

electricity	-	8400 kwh at \$.06/kwh	=	\$ 504
natural gas	-	129 MCF at \$4.00/MCF	=	\$ 516
gasoline	-	750 gallons at \$1.25/gallon	=	<u>\$ 938</u>
		Annual Total:		\$1,958

2000

electricity	-	7200 kwh at \$.08/kwh	=	\$ 576
natural gas	-	80 MCF at \$9.16/MCF	=	\$ 733
gasoline	-	600 gallons at \$2.50/gallon	=	<u>\$1,500</u>
		Annual Total:		\$2,809

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CHART VIII

ENERGY COSTS AS A PERCENTAGE OF PERSONAL INCOME - RAVENNA

(1983 dollars)

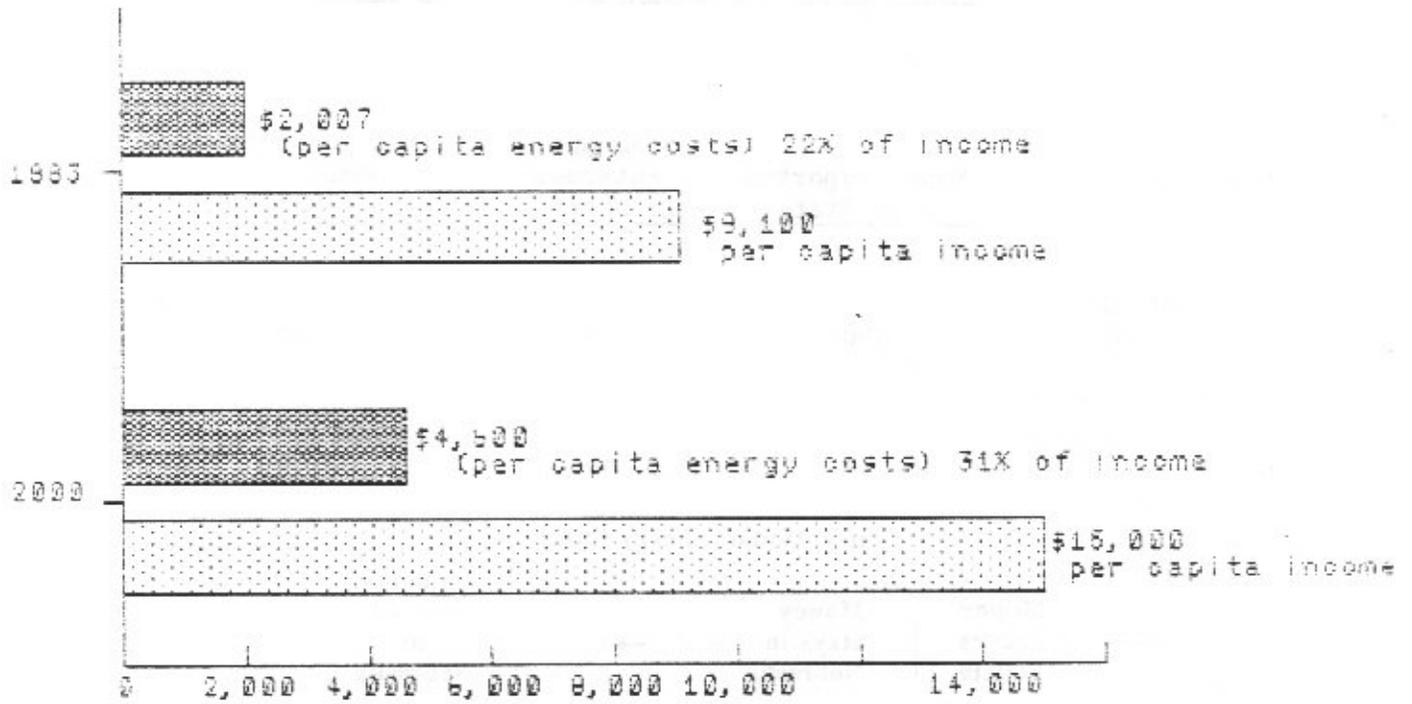
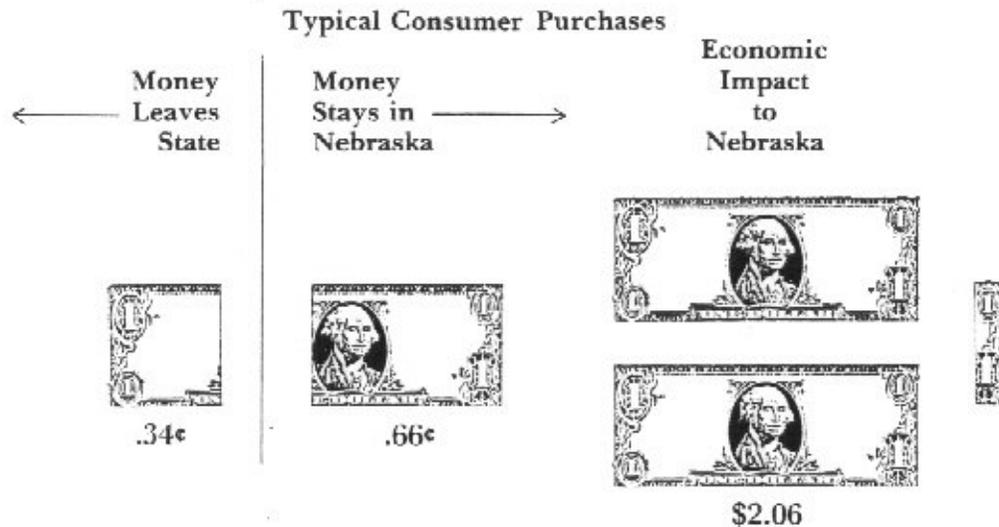
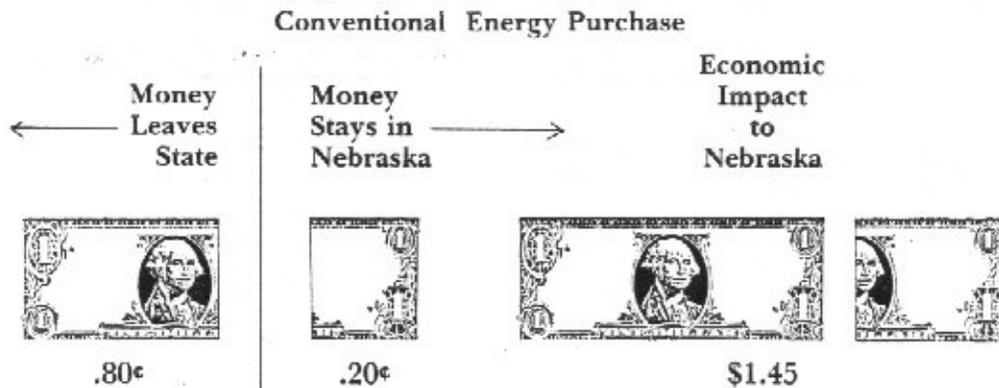


TABLE E

ESTIMATED LONG TERM NET ECONOMIC EFFECTS  
OF A ONE DOLLAR PURCHASE OF CONVENTIONAL ENERGY SUPPLIES  
VERSUS  
CONSERVATION OR NORMAL CONSUMER PURCHASES

<u>One Dollar Purchase</u>	<u>Money Exported From State</u>	<u>Amount Retained In Nebraska</u>	<u>Net Economic Nebraska Multiplier</u>
Conventional Energy Supplies	.80	.20	1.45
Conservation or normal consumer expenditures	.34	.66	2.06



Under a business-as-usual scenario, total energy costs can be expected to increase almost 150 percent or more, through 2000, depending upon how strong the economic recovery proves to be.

If we anticipate the higher energy prices projected in Table C, the total energy bill for the community can be expected to increase from \$2.61 million to \$6.46 million by the end of the century. Each dollar diverted from other sectors to pay for a higher energy bill "costs" the economy about \$0.61 in lowered productivity. A \$3.85 million increase in the overall energy bill implies that Ravenna will contribute approximately \$2.35 million less to the Gross State Product (See Table F, column 2).

Pursuing a conservation or an energy management scenario--one that takes advantage of improvements in energy efficiency as discussed earlier in this report--it is possible to reduce the projected 2000 consumption to 75 percent of the baseline scenario, or down to 263.1 billion Btus from the projected 350.8 billion Btus under the business-as-usual scenario.

If a positive multiplier effect is achieved by diverting money away from conventional energy expenditures, the conservation scenario can generate an increase in local economic activity of \$1.2 million compared to the business-as-usual approach. This again suggests that energy conservation programs can become a major source of local economic redevelopment in Ravenna.

# # # # #

TABLE F  
ECONOMIC CONTRAST BETWEEN  
BUSINESS AS USUAL AND CONSERVATION SCENARIOS  
IN RAVENNA, NEBRASKA

<u>Business-As-Usual</u>			<u>Conservation (25 percent reduction)</u>	
	<u>Consumption</u> <u>(billion BTUs)</u>	<u>Costs</u> <u>(million</u> <u>1983 \$)</u>	<u>Consumption</u> <u>(billion BTUs)</u>	<u>Costs</u> <u>(million 1983 \$)</u>
1983	350.8	2.61	350.8	2.61
2000	378.9	6.46	263.1	4.49
<u>Net increase in</u> <u>2000 energy bill</u>		3.85		1.88
<u>Loss to economy</u> <u>as a result of</u> <u>expenditures in</u> <u>excess of 1983</u> <u>costs</u>		-2.35		-1.15
			<u>Gain to economy</u> <u>as a result of</u> <u>2000 conservation</u> <u>compared to</u> <u>business-as-usual</u> <u>scenario in year</u> <u>2000.</u>	+1.20

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