

ENERGY SUSTAINABILITY PLAN

INTRODUCTION

During the 2010 session of the Nebraska Unicameral, the State Senators approved and the Governor signed LB 997. This law requires that all counties and municipalities, except villages, in Nebraska when in the process of updating their comprehensive plans, incorporate an energy element. This statute specifies that the energy element shall: *“Assess energy infrastructure and energy use by sector, including residential, commercial and industrial sectors, evaluate utilization of renewable energy sources and promote energy conservation measures that benefit the community.”*

The later portion of the above statutory wording implies that municipalities and counties should develop plans which will have the effect of reducing energy use and costs as well as creating “sustainable” communities. A “sustainable” community in this sense is a community or county that works to develop the ability to provide for present energy needs without jeopardizing the ability of future generations to live in the same or improved manner as we do today.

The need for an energy element is prompted by a convergence of factors, including fluctuating but generally rising cost of energy and the negative impacts that such

rising costs have on consumers and the local economic development, dependence on imported oil and gas in a setting of global political instability, environmental concerns regarding fossil fuel pollution and mining, vulnerability of our centralized energy systems to terrorist threats, and the relationship of our energy use to climate change.

In addition to the above noted factors, it is important to understand that the production and use of energy in the United States and thus York County is a critical part of our quality of life and our national and local economy. Virtually every aspect of our national and local economies and quality of life is associated with the use of energy. We all use energy in some form to light and heat our homes, operate our businesses and industries, producing, preparing and preserving our food, transportation, law enforcement, fire protection, health care and even our recreational opportunities.

These factors and the reality of dwindling supplies of non-renewable fossil fuels world-wide has prompted the Federal Government and the State of Nebraska to adopt policies that are more insistent on curbing increased reliance on fossil fuels. For example, Federal policy has set a goal of

20% of electrical power generation in the United States by the year 2010 be from renewable sources such as wind, solar, nuclear, or other renewable sources.

Successful energy strategies will decrease our overall energy use through conservation and efficiency and the development of renewable forms of energy. The benefits of successful strategies include:

- Decreasing costs to taxpayers, energy utility rate payers, individual households, businesses and industries,
- Enhancing spendable incomes of local citizens and enhancing opportunities for future local economic development,
- Increasing comfort in a northern climate,
- Decreasing pollution,
- Diversifying and distributing our energy systems to increase energy security,
- Decreasing carbon and other emissions which many believe is contributing to global climate change.

Local citizens will question what a small county like York County can do to make a better environment and enhance the “sustainability” of the County. The reality is that County leaders and every citizen can

make a small, but positive, impact for a better environment now and for the future sustainability of the County for the next generation.

This energy element is structured to not only comply with the requirements of LB 997, as indicated above, but will also identify strategies that the County governing officials and citizens of the County can utilize to reduce energy use and costs now and in the foreseeable future, as well as enhance the present and future environment and local economic development opportunities.

ENERGY INFRASTRUCTURE AND USE

The energy infrastructure in York County consists of publicly and privately owned and operated facilities and services to provide:

- electrical power,
- natural gas,
- petroleum products, and
- other energy sources such as combustion of wood, geothermal and solar energy for heat and/or cooling.

An analysis of energy use within this infrastructure in York County has considerable variables resulting from anything from local annual changes in economic activity to year to year weather

conditions. For these reasons and for lack of data for some types of energy, it is more reasonable and most likely more accurate to utilize documented statewide statistics and averages regarding energy consumption to evaluate local energy use.

The following is a statistical analysis of energy use in the County which utilizes statewide data converted to the population and economic activity in York County utilizing per capita statewide energy use data and population data for York County in 2011. It is important to understand that this data includes York County's population's share of energy use by energy providers to provide the energy at the local level. The data includes, for example, the energy used to produce electricity which is in turn used by customers in York County.

The data presented is in the form of British Thermal Units (Btu's) which is a standard measure of heat energy. A British Thermal Unit is defined as the energy it takes to raise the temperature of water by one degree Fahrenheit at sea level. For example it takes approximately 2,000 Btu to brew a pot of coffee. A Btu is equivalent to 0.293 watt-hours.

Estimated energy consumption by sector in York County for 2012, the last year with complete data, is indicated in Table 21. The

estimated total energy use in York County in 2011 was 6,480,000,000,000 (6.48 trillion) Btu's.

The industrial sector in York County, which includes the agricultural sector, is the largest energy consumer utilizing nearly 43% of total energy consumption in the County.

The transportation sector is the second largest consumer of energy. This sector consists primarily of automobile and truck usage of energy. This sector used slightly over 23% of the total energy consumed in York County in 2011.

The residential sector utilized 1,010,000,000,000 Btu's of energy in 2011, comprising the third largest energy use in the County. Residential energy use consists of energy used for heating, cooling, heating of water, food preparation and preservation, lighting, ventilation and communications including television and computer use.

The smallest energy use sector in the County is the commercial sector. The sector utilized only 18% of total energy consumption in the County in 2011.

In order to have a better understanding of energy consumption in the County and to provide information regarding which end use sectors have the most potential for

TABLE 21**TOTAL ESTIMATED ENERGY CONSUMPTION BY SECTOR – 2011
York County, Nebraska**

| Use Sector | Estimated Energy Consumption (trillion Btu's) | % of Total Consumption |
|----------------|--|------------------------|
| Commercial | 1.01 | 15.1% |
| Industrial | 2.77 | 42.7% |
| Residential | 1.19 | 18.4% |
| Transportation | 1.51 | 23.3% |
| TOTAL | 6.48 | 100.0% |

Source: Nebraska Department of Energy with conversion of statewide data by Stahr & Associates, Inc.

energy conservation an analysis of the types of energy used by each sector is needed.

The data presented in Table 22 provides details regarding which sectors uses which forms of energy together with which sector utilized what portions of each type of energy.

NATURAL GAS CONSUMPTION

As indicated in Table 22, in 2011 an estimated 1,000,000,000,000 Btu's of natural gas was consumed in the County. Of this total, the industrial sector, which includes agricultural production, utilized over 650,000,000,000 Btu's or over 51% of all natural gas consumed in the County.

TABLE 22**TOTAL ESTIMATED ENERGY CONSUMPTION BY SECTOR
AND TYPE OF ENERGY - 2011
York County, Nebraska**

| Use Sector | Type of Energy Consumption (trillion Btu's) | | | | | | | | Total |
|----------------|---|-------------|-------------|-------------|--------------------------|-------------|--------------------|-------------|------------|
| | Natural Gas | % of Total | Petroleum | % of Total | Electricity ¹ | % of Total | Other ² | % of Total | |
| Commercial | 0.24 | 19.1% | 0.01 | 0.6% | 0.75 | 31.0% | 0.02 | 2.2% | 1.0 |
| Industrial | 0.65 | 51.6% | 0.27 | 15.2% | 0.86 | 35.5% | 0.84 | 91.3% | 2.6 |
| Residential | 0.30 | 23.8% | 0.06 | 3.4% | 0.81 | 33.5% | 0.02 | 2.2% | 1.2 |
| Transportation | 0.07 | 5.6% | 1.44 | 80.8% | 0.00 | 0.0% | 0.04 | 4.3% | 1.6 |
| TOTAL | 1.26 | 100% | 1.78 | 100% | 2.42 | 100% | 0.92 | 100% | 6.4 |

Source: Nebraska Department of Energy with conversion of statewide data by Stahr & Associates, Inc.

1. Electricity consumption includes transmission energy losses
2. Other energy consumption includes geothermal, wood, solar energy and losses and co-products associated with renewable energy production
3. Industrial consumption includes agricultural production consumption

The residential sector in the County consumed the second largest amount of natural gas. In 2011, residential uses consumed 300,000,000,000 Btu's or just under 24% of total natural gas consumption. In this sector natural gas is used primarily for heating of residential dwellings, heating of water and cooking and baking of food. This sector has considerable potential for energy conservation through enhancement of the energy efficiency of each residence. Even only a 10% reduction in consumption would result in a savings of some 30,000,000,000 Btu's of natural gas per year. At current prices for natural gas, this would result in a savings of over \$130,500 per year for local residents.

The commercial sector consumed just under 22% of the natural gas consumed in York County in 2011. The estimated 240,000,000,000 Btu's consumed by the commercial sector was used for a variety of purposes including heating and food preparation. Like the residential sector, there is considerable potential for energy conservation through enhancement of the energy efficiency of commercial buildings and processes.

The transportation sector consumed a quite limited quantity of natural gas in 2011.

PETROLEUM CONSUMPTION

In 2011 an estimated 1,780,000,000,000 Btu's of petroleum products were consumed in York County. As would be expected the vast majority of petroleum product consumption was used for transportation of people and goods. Of the total petroleum products consumed 41% was motor gasoline and 47% was diesel fuel. Diesel fuel is used primarily in the production of crops and transportation of crops, livestock and goods while motor gasoline is used for transportation of people - our automobiles and pickup trucks.

There is considerable potential for reductions in both diesel fuel and motor gasoline consumption through either conversion to renewable sources or through reductions in usage. The use of bio-diesel can substantially reduce the use of petroleum based diesel fuel while the use of higher levels of ethanol enriched motor gasoline can substantially reduce the use of petroleum based gasoline. A change of only 5% in the type of diesel and motor gasoline could have considerable impact on the demand for oil based fuels. A 5% conversion of the type of diesel and motor gasoline would result in a reduction of 89,000,000,000 Btu's of consumption of oil based fuels.

ELECTRICAL ENERGY CONSUMPTION

Consumption of electrical energy in York County in 2011 is estimated to have been 2,420,000,000,000 Btu's. This consumption is comprised of two parts. The first part is the net consumption of electrical energy by all use sectors in the County. The second part is the energy loss in the electrical energy transmission system that represents the County's portion of the total energy delivery system loss on a per capita basis. Approximately 31% of the electrical energy consumption, some 750,000,000,000 Btu's, consists of actual use by all sectors in the County. The balance of the total consumption (69%) or some 1,670,000,000,000 Btu's represents the electrical energy loss in the transmission system to get the electrical energy to the County.

Electrical energy consumption in York County in 2011 was very evenly split between the residential, commercial and industrial sectors. There was no usage of electrical energy in the transportation sector.

Although the industrial sector consumption of electrical energy is primarily in the irrigation of crops and manufacturing processes, there is considerable potential for conservation of energy in this sector as well as the commercial and residential sectors. A large portion of electrical energy

consumption is used for heating, cooling, food preparation, lighting, water heating and appliance use. The enhancement of these components in terms of energy efficiency would result in substantial electrical energy conservation in all use sectors.

ENERGY CONSUMPTION FROM RENEWABLE SOURCES

It is estimated in 2011 all economic sectors consumed approximately 946,000,000,000 Btu's in energy derived from renewable sources. However, as indicated in Table 23, 89% of renewable energy consumption occurred as losses and co-products generated in the production of ethanol, thus the net consumption of energy from renewable sources in York County is estimated to have been only 102,000,000,000 Btu's. This amounted to only 1.5% of total energy consumption in 2011.

Of the renewable energy resources consumed in York County in 2011, 7.2% was use of ethanol and bio-fuel products consumed primarily by the transportation sector. The second largest consumption of renewable energy was the estimated 240,000,000,000 Btu's of wood and waste consumed primarily by the residential sector. The third largest consumption category of renewable energy was in the form of geo-thermal energy used

TABLE 23

**ESTIMATED ENERGY CONSUMPTION BY SECTOR FROM RENEWABLE ENERGY SOURCES - 2011
York County, Nebraska**

| Use Sector | Type of Energy Consumption (trillion Btu's) | | | | | | | | | | TOTAL |
|----------------|---|-------------|----------------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|
| | Ethanol & Bio-Fuel | % of Total | Losses & Co-Products | % of Total | Wood & Waste | % of Total | Geo-Thermal | % of Total | Solar | % of Total | |
| Commercial | - | - | - | - | 0.003 | 12.5% | 0.003 | 33.3% | - | - | 0.006 |
| Industrial | 0.031 | 45.6% | 0.844 | 100.0% | 0.004 | 16.7% | - | - | - | - | 0.879 |
| Residential | - | - | - | - | 0.017 | 70.8% | 0.006 | 66.7% | 0.001 | 100.0% | 0.024 |
| Transportation | 0.037 | 54.4% | - | - | - | - | - | - | - | - | 0.037 |
| TOTAL | 0.068 | 100% | 0.844 | 100% | 0.024 | 100% | 0.009 | 100% | 0.001 | 100% | 0.946 |

Source: Nebraska Department of Energy with conversion of statewide data by Stahr & Associates, Inc.

primarily in water to air heat pump systems for heating and cooling of buildings.

The smallest use of renewable energy was the use of solar energy. Less than 1/10 of 1% of the renewable energy use was in the form of solar energy.

It should also be understood that a portion of the electrical energy consumption in the County is derived from renewable resources. In 2011 approximately 7.2% of total electrical energy consumption in the State was generated through the use of renewable resources including hydroelectric power, wind power and combustion of wood and wood waste. Thus total consumption of energy from renewable energy sources in the County in 2011 is estimated to have been 8.7% of total energy consumption by all sectors.

ENERGY EFFICIENCY AND CONSERVATION STRATEGIES

Energy conservation is the wise use of energy and the avoidance of waste. Energy efficiency refers to achieving the same desired goal, such as powering a building while reducing the energy inputs or “doing more with less”. Energy savings are often achieved by substituting technology more advanced equipment to produce the same level of end-use.

Conservation can be achieved on several levels, from walking or biking instead of use a car to adding more insulation to a building. Efficiency examples include using high efficiency Energy Star appliances and systems, substituting compact florescent (CFL) or light emitting diode (LED) light bulbs for less efficient incandescent lighting.

Energy conservation is the first priority in achieving energy efficiency in existing buildings. A stepwise approach using energy assessment, audit and weatherization is recommended. An assessment of energy intensity or general energy use of a residential, commercial, industrial or governmental building can be done using an online energy assessment calculator such as the EPA Home Energy Yardstick.

Where an energy use assessment indicates notable energy use inefficiencies, the assessment can be followed up by an energy audit which is usually performed by a building science professional and may employ technology such as infrared cameras and pressurizing equipment. Weatherization or energy retrofit is based on the results of the assessment and audit. Significant decreases in electric and thermal energy needs can be achieved by this approach and the cost of the energy audit and the work is offset by the energy cost savings and possible rebates from state or federal sources.

Using efficient building methods and efficient systems for new construction will reduce energy use and operating costs over time. Creating local requirements that new construction meet or exceed the State Energy Code is one approach worth considering in York County.

ENERGY EFFICIENCY AND CONSERVATION GOALS AND STRATEGIES

The best way to achieve higher energy efficiencies in the short and near term in York County is to encourage the implementation of energy conservation measures in all energy use sectors and implement programs and projects to improve energy efficiency in County buildings and operations.

The following goals and strategies are recommended to maximize the potential for energy conservation:

GOAL: Improve the energy efficiency of County Buildings and Operations

York County should lead by example to show residents and businesses in the County how they can conserve energy, reduce their impact on climate change and reduce their dependence on fossil fuel energy. In order to accomplish this goal the following strategies are recommended:

- Assess and benchmark the energy efficiency of all County buildings,
- Audit and retrofit those County buildings where the assessment and audit indicates additional energy efficiency can be achieved.

- Evaluate the County’s vehicle fleet, including automobiles, trucks and road maintenance equipment with regard to use of higher levels of ethanol fuel and biodiesel fuel. In the case of gasoline with higher levels of ethanol such as E-85 and biodiesel, the costs are slightly higher than standard oil based fuels. However, the benefits of generating higher demand for these renewable fuels will help reduce costs in the long term.
- Implement a purchasing strategy for future acquisitions of Energy Star equipment in all County facilities.
- Encourage the City of York and the villages within the County to analyze street lighting efficiencies and replacement of street lighting if energy efficiencies are sufficient to warrant a conversion.

GOAL: Promote conservation and energy efficiency in the private sectors of the local economy.

For the benefit of all of its citizens, York County should take the lead in promoting energy efficiency and conservation in the private sectors of the local economy by implementing the following programs:

- Showcase County actions to educate the public on successes of energy conservation measures. Communicating the energy conservation actions and results can be accomplished through newspaper coverage and having such information available in a County web site.
- Work with the York News Times and the Nebraska Energy Office to create an on-going communication program which promotes energy conservation by informing readers what they can do to conserve energy. Through an on-going series of articles, this program should address a number of energy conservation elements including:
 - How readers can access and utilize the EPA Home Energy Yardstick to provide a no-cost initial energy consumption assessment.
 - How to access energy audit expertise if a detailed energy audit is desired by any reader.
 - What specific energy conservation actions can be taken together with typical

costs and pay periods. This component should address all aspects of energy conservation ranging from replacement of incandescent light bulbs with compact florescent bulbs, addition of installation, installation of programmable thermostats, installation of low -e windows and doors and installing Energy Star appliances, furnaces and air conditioning equipment.

- What programs and incentives are available to help pay for the cost of energy conservation efforts and how to access these programs.
- Consumer guides to the utilization of small wind energy systems, solar panels and geo-thermal equipment and the pay-back periods associated with each.

RENEWABLE ENERGY

General Characteristics

The U.S. Department of Energy defines renewable energy as “energy which comes from sources whose supplies are regenerative or virtually inexhaustible”. Proponents recommend expansion of these sources to meet future energy demands, diversify energy sources and minimize environment impacts.

While there are a host of benefits to renewable energy projects including reduced emissions and decreased transmission losses in a decentralized energy grid, there are negative impacts. These include environmental impacts to wildlife habitat, visual changes to the landscape and economic constraints. Renewable energy sources are inexhaustible, although sometimes limited in the amount of energy available per unit of time. A wind power generator may generate a lot of energy when the wind is blowing, but no energy when there is no wind. Both the positive and negative impacts need to be weighed against each other so an informed and educated decision can be made about their expanded role in Nebraska and Dundy County.

Renewable energy contributes to energy assurance by adding diversity and additional energy resources to meet the County’s needs. It also provides energy security by

using indigenous energy resources which are less subject to geopolitical influences. These sources provide environmental protection by reducing pollution and other negative impacts on air, water and land while meeting the energy demand in ways that can be maintained indefinitely. There are also opportunities to create economic stability and growth by using renewable energy technology to retain dollars in-state and in-county, create new jobs and stimulate the local economy.

Development of additional renewable energy sources is also important due to our increased use of energy. From 2001 to 2011 total energy consumption in Nebraska increased by over 217,500,000,000,000 Btu's representing an increase of over 33%. As non-renewable energy sources become more scarce and as prices for more scarce resources increase, the need for the development of renewable energy sources also increases.

Renewable Energy in Nebraska

In Nebraska there are an abundant renewable energy possibilities, especially wind, solar, wood, geothermal, biomass (ethanol), biodiesel, hydroelectric and methane gas. Currently some of these renewable energy resources (especially wind, geothermal and methane gas) are greatly underutilized. In Nebraska, from

2001 to 2011, energy use from renewable sources increased by 29.1%. However, use of renewable energy sources still constitutes only 8.7% of total energy consumption.

The greatest progress in renewable energy technology has occurred within the wind power industry. In the early years of wind energy technology, electricity production cost was approximately 30 cents / kwh. By 2002, cost of electricity production from wind energy systems dropped dramatically to 3 to 5 cents / kwh and has remained relatively stable since. Although improvements in technology for small wind energy generators has improved, but energy production cost vary widely depending on the application. Energy production costs for these small systems range from 11 to 90 cents / kwh.

Geothermal technologies have not had such a dramatic advancement, however, these systems are among the cheapest renewable energy sources to produce electricity at 2 to 4 cents /kwh. This cost is the average for geothermal power plants. Another form of geothermal energy use in the use of geothermal heat pumps. These systems are becoming very popular for commercial and residential applications because they are 3 to 4 times more efficient than a typical high efficiency fossil fuel furnace for space heating.

The highest price for electricity from a renewable energy source is from photovoltaic panels which average about 38 cents / kwh.

For comparison, electricity produced from traditional fuel sources cost approximately:

- 4 - 5 cents / kwh for coal
- 10-12 cents / kwh for oil
- 4-5 cents /kwh for natural gas, and
- 3-4 cents / kwh for nuclear.
- 4-10 cents / kwh for wind
- 5-8 cents / kwh for geothermal
- 8-18 cents for solar

Therefore it can be said that properly sited renewable energy projects are price competitive with traditional fuel sources.

Renewable Energy in York County

As a single governmental entity, York County is somewhat limited in what it can do to encourage the development of renewable energy generation projects, but the County can and should implement several strategies and projects to encourage the use of renewable energy sources in the County. These can include:

- The County Board of Commissioners should evaluate the potential cost savings of retrofitting the courthouse and/or other County buildings with closed-loop

geothermal heat pumps and, where there would be a notable savings, budget for and implement such projects.

- Adopt codes that require compliance with the Nebraska State Energy Code for all new and retrofitted buildings utilizing compliance certification by the Nebraska Energy Office and encourage green building design, geothermal and solar energy production systems.
- Evaluate the benefits of utilization of gasoline with a higher percentage of ethanol and bio-diesel in the County's automobile and road maintenance fleets.
- Similarly, as increased availability of electric and hybrid vehicles occurs, the County should evaluate such vehicles to determine if replacement of existing vehicles would be warranted.

It should also be noted that the local energy consumption sectors in York County will now and in the future be utilizing electrical power generated by more renewable energy sources. The Nebraska Public Power District, which supplies electrical power to the County, has agreed that it will utilize renewable energy sources to produce 10% of

its total electric energy by the year 2020. This will be a notable increase in electric power produced by the use of renewable sources. In 2011 production of electrical energy from renewable resources amounted to 7.2% of total electric power generated, a substantial increase over the last decade.