City of Sidney

Appendix #7
Energy and Environment

Comprehensive Development Plan 2012

Sidney, Nebraska……..Small Town Values……..Big Time Opportunities

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Environmental Characteristics

- Geographic Location
- Climate
- Floodplain
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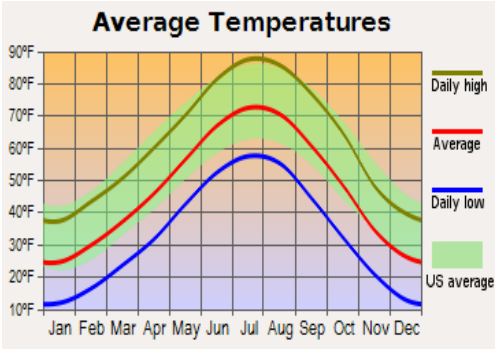
Geographic Location

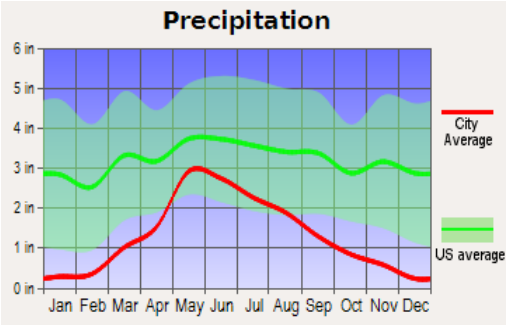
The City of Sidney is located in Cheyenne County in the southern end of Western Nebraska's Panhandle. Sidney is located at the junction of Highways 30, 385, 19 and Interstate 80.

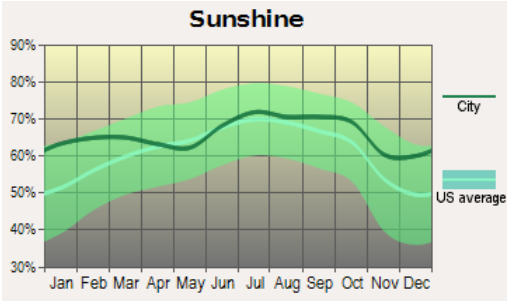
Sidney is not located within commuting range of a metropolitan city, but it is within reasonable distance for engaging in economic activity. Cheyenne, the nearest metropolitan area, is 95 miles west of Sidney while Denver, the closest large metropolitan area, is 165 miles southwest of Sidney. Scottsbluff is 76 miles from Sidney while Omaha is nearly 400 miles to the east.

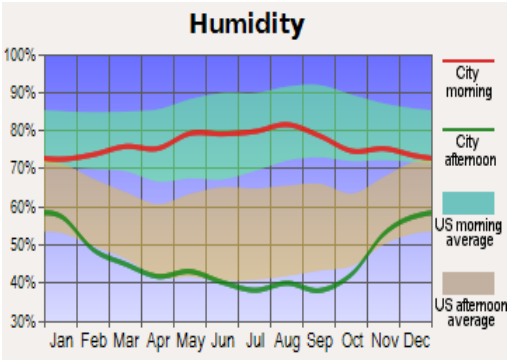
One of the city's location disadvantages is the state capital in Lincoln is 337 miles away. Sidney is much closer to the state capitals of Colorado and Wyoming.

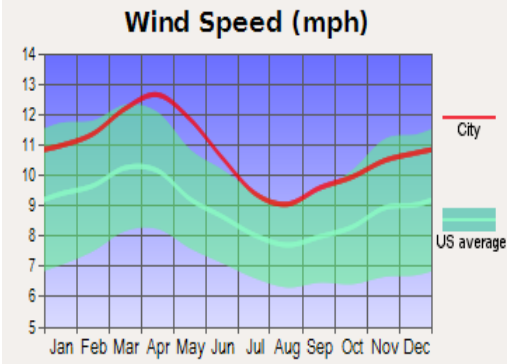
Loc











Climate

Sidney has an attractive semi-arid living climate that is highlighted by low humidity and many sunny days.

Sidney has a semiarid climate as a result of its relatively close proximity to the Rocky Mountains which affect climatic conditions by blocking and redirecting wind patterns and/or precipitation. Over the past 30 years, annual precipitation levels in Sidney have averaged just over 16 inches a year.

Most of Sidney's precipitation falls in the form of rain between April and September. The average seasonal snowfall is about 41 inches, while an average of 20 days per year have at least one inch of snow on the ground. May is the wettest month with 3.7 inches of rain, while January is the driest month with just 0.4 inches of precipitation.

The heaviest one day rainfall in Sidney occurred on June 11, 1970 when 4.54 inches of rain fell. Droughts, though, are more common to the area. Precipitation between April and September will be less than 12 inches in two years out of every ten,

Due to Sidney's location near the center of a large continent, extreme variances in temperatures are experienced during the year. In winter, periods of moderately cold temperatures are interrupted by spells of bitterly cold temperatures that can last up to a week or longer. The average high temperature in January is 37 degrees F while the average low temperature in January is 12 degrees F. The lowest temperature ever recorded in Sidney occurred on January 19, 1963 when the thermometer dipped to -30 degrees F.

Summers, conversely, are warm with periods of very hot weather. The relatively low humidity, which averages 50% at midafternoon, makes the periods of hot weather more comfortable than in the eastern part of the state. The average high temperature in July is 87 degrees F while the average July low is 56 degrees F. The highest temperature ever recorded in Sidney occurred on July 11, 1954 when the thermometer rose to 107 degrees F.

Average wind speeds in Sidney are higher than the national average. Wind speeds range from an average of 9 mph in August to 13 mph in April.

A majority of the days in Sidney are sunny. In summer the sun shines 70% of the time possible while in the winter the sun shines about 60% of the time.

Severe thunderstorms occasionally occur during the spring and summer. Some of these storms are accompanied by hail which can damage or destroy homes, vehicles, and crops. On a scarce occasion, tornadoes can also occur as part of these storms. In the spring, severe duststorms can occasionally occur.

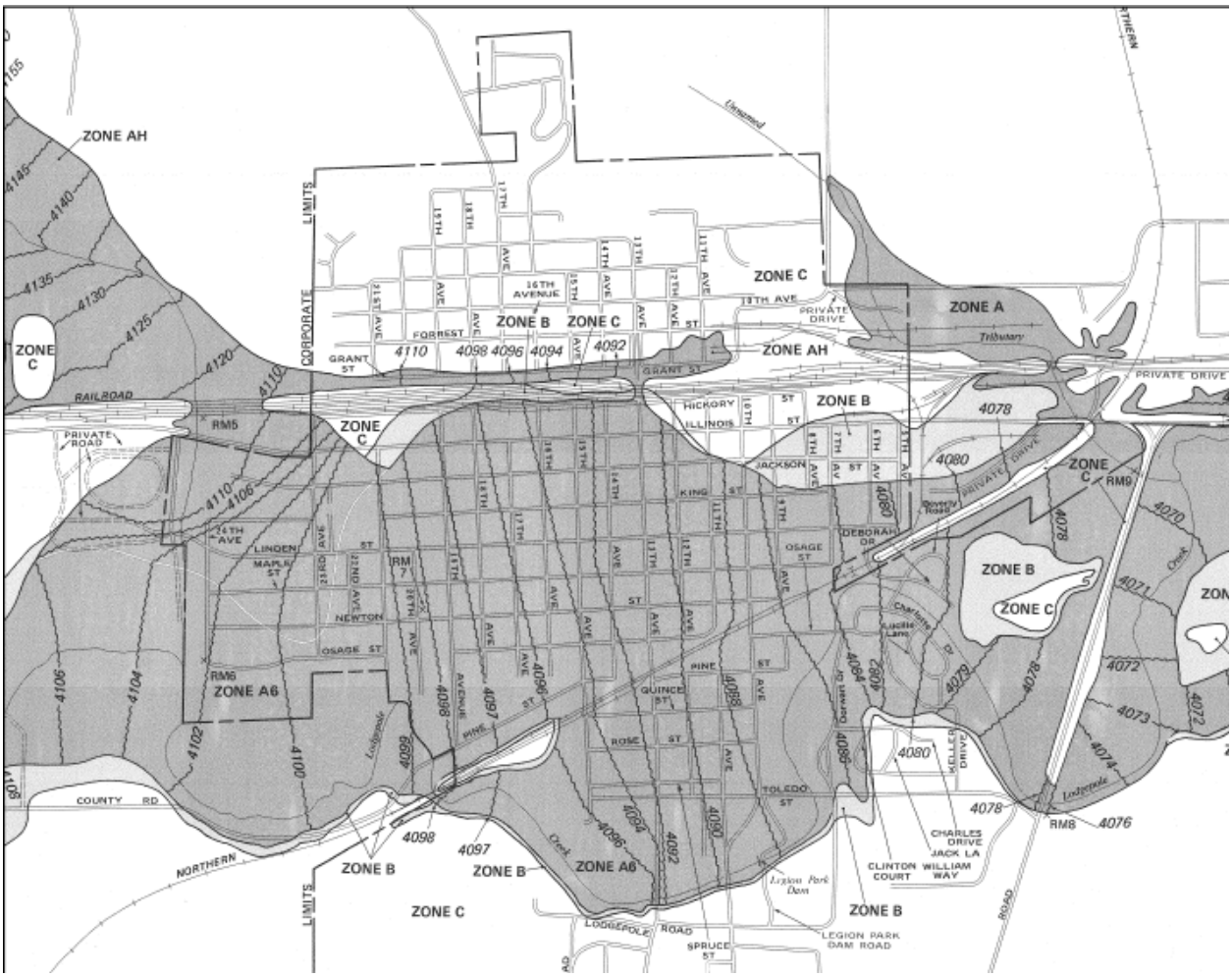
Floodplains

The City of Sidney completed a flood reduction project in December 1995 that enables the containment of the 100 year floodplain within a drainage channel. Prior to this project, most of the community lying between Grant Street and Lodgepole Road was designated as being within the 100-year floodplain. This area is now in the 500-year floodplain.

The map below shows the most recent FIRMA map for Sidney which was completed in March 16, 1981 before the flood reduction project. The areas which used to be in Zone A, the 100-year floodplain, are now located in the 500 year floodplain.

Even though the Sidney Flood Reduction Project and the development of upstream projects like Oliver Reservoir have significantly mitigated the potential for severe flooding from Lodgepole Creek, due to Sidney's level topography at the bottom of the Lodgepole Valley, the City is prone to localized flooding, especially in the downtown area. The City has addressed this issue by completing a downtown drainage project in 2006.

Sidney Flood Insurance map BEFORE Flood Reduction Project



Surface Water Features

Sidney does not have any rivers or significant sized lakes. Lodgepole Creek, a small stream which flows through the central part of the city, is the only significant surface water in the City.

Lake McConaughy, Nebraska's largest Reservoir, is only 83 miles to the east. This public recreation area provides Sidney residents with opportunities for great fishing, sand beaches, swimming, boating, and sailing.

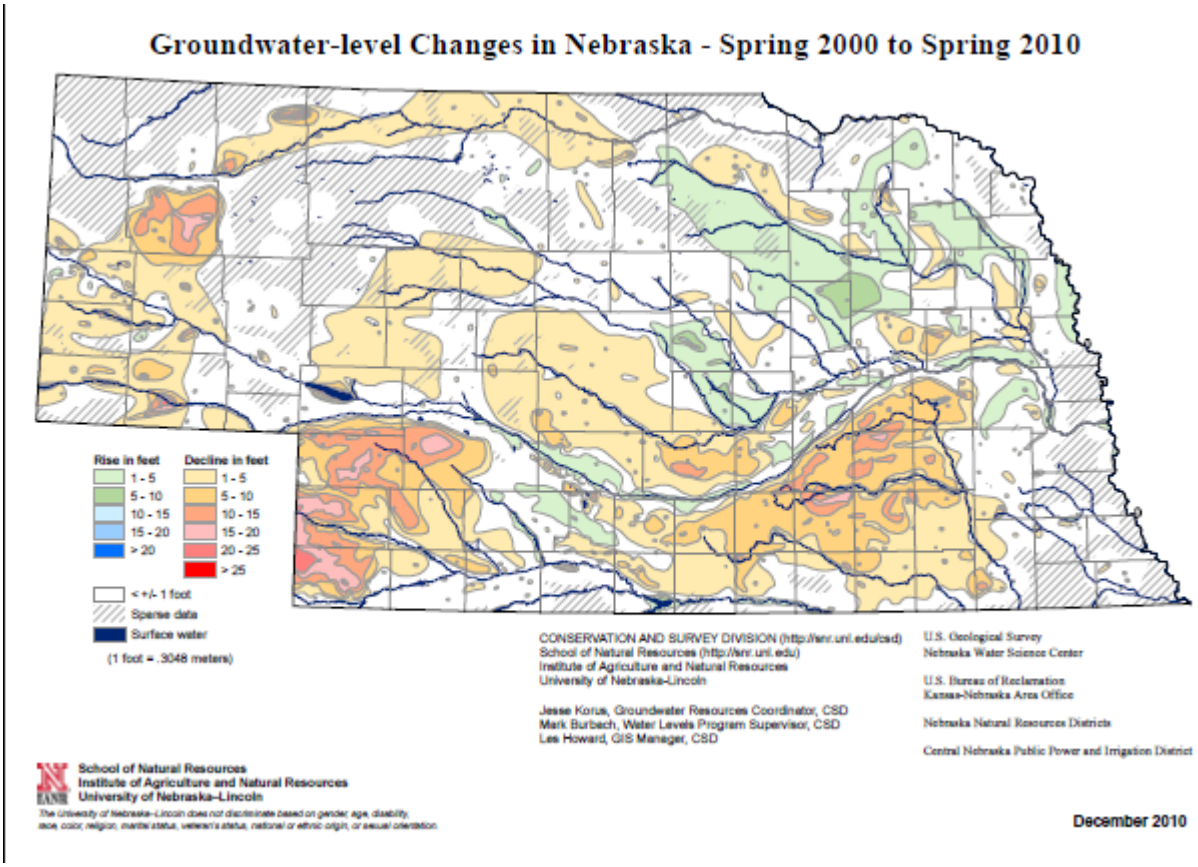
Ground Water Resources

Sidney historically obtained most of its water from fractured zones in the Brule Formation. However, the Brule Formation generally yields only small amounts of water to wells. While large initial yields of water can be found in fractures, they are often followed by rapid declines.

As these limited groundwater resources in the Lodgepole Creek Valley came under increased development pressure in recent decades, private and municipal supplies risked running dry during times of drought.

After a serious water crisis in 2003 when some businesses temporarily lost access to water supplies, the City underwent a $14 million project to access water in the upland areas well north of the city. With this new investment, the domestic water supply and quality for the City are both generally good. The water ranges from hard to very hard but otherwise is low in mineralization.

Contamination of water supplies is a potential problem. Chemicals introduced during agricultural activities, human and animal wastes that have been improperly disposed, leaking fuel storage tanks, and commercial and household chemicals that have been carelessly discarded are possible sources of contamination.



Physiography/Elevation

Sidney is located in the High Plains region of the Great Plains. Lodgepole Creek, which flows from west to east through the center of town, has cut a channel about 200 feet below the higher areas that lie to the north and south of town. The elevation in Sidney is approximately 4,090 feet at City Hall and about 4,300 at the airport south of Sidney.

Geology

The oldest exposed rock unit in Cheyenne County is the upper part of the Brule Formation which is the youngest formation of the White River Group of the Oligocene epoch (33 to 29 million years old.) The Brule Formation predominantly consists of volcanic debri that was transported to Cheyenne County by wind.

Lying directly above the Brule Formation is the Ash Hollow Formation of the Ogallala Group. This formation is of Miocene age. These sediments were transported and deposited by streams draining out of the Rocky Mountains.

Material that is younger than the Ash Hollow Formation in the county includes unconsolidated windblown silt and sand covering parts of the uplands, stream deposits beneath valley floors and terraces, and slope deposits along the sides of valleys. All of these deposits appear to be relatively young with most of them being less than 20,000 years old.

Vegetation

Native vegetation in Sidney consists mainly of grasses, with the remainder being made up of grass-like plants, forbs and schrubs. Blue grama, little bluestem, buffalograss, needleandthread, sideoats grama, threadleaf sedge, western wheatgrass, prairie sandreed, and sand bluestem are the dominant species.

Trees

One of the largest concentration of trees in Cheyenne County occurs within the City of Sidney. The presence of these trees enhances the beauty and character of the City. These trees are not evenly distributed throughout town, though. Many of the newer housing areas have very few, if any, mature trees.

The older neighborhoods have a good supply of trees. However, there are many instances of dead and dying trees in these neighborhoods Although dead and dying trees often serve a useful purpose in the rural parts of the county, they are a liability in an urban setting. The existence of trees in poor condition not only detracts from the visual attractiveness of the community, it also presents a potential hazard. Dead branches are often broken by high winds and snow, causing potential damage or harm to electric lines, parked cars, pets, and people.

The most significant tree maintenance problem facing the City is a large number of poor, dead or dying Siberian Elm and Cottonwood trees. It is important for the town to remove and destroy these dead trees as many diseases have origins in dead wood.

Replacing dead trees with an appropriate species of trees suitable for a semi-arid climate is needed to maximize planting efforts. When planting trees along a street right of way, it is not a good idea to grow evergreen trees. It is also ill-advised to grow large broadleaf trees under power lines. Growing a wide variety of trees to minimize the effects of disease is also important. The following table lists landscape trees that are recommended for growth in Western Nebraska.

Temporal Elements

The length of daylight varies greatly throughout the year in Sidney. On the first day of winter, the City only receives 9 hours 13 minutes of daylight with the sun setting at 4:27 p.m. MST. On the first day of summer, the City receives approximately 15 hours and 9 minutes of daylight with the sun setting at 8:28 MDT.

The City is located in the Mountain Time Zone which has many under-appreciated benefits, especially for sports fans. While people in the eastern US often miss the end of events like Monday Night Football and the World Series because the games run well past midnight, Sidney residents can watch the entire game without having to rush home like those on the west coast.

Soils

The following paragraphs highlight the major soils in Sidney and their development-related characteristics. A map of local soils and more detailed information can be found in the Cheyenne County soil survey.

Bayard fine sandy loam is the most common soil in Sidney. This very deep soil makes up a majority of the soil in the northern and central parts of the City. Permeability of this soil is moderately rapid, and runoff is slow to medium, depending on the soil's slope. Slopes range from nearly level by Lodgepole Creek to 6 to 9 percent near the northern and southern edges of this soil's range. The soil is suited for dwellings, small commercial buildings, and septic tank systems.

A large area of McCook very fine sandy loam is located in the central to southern part of the City. This soil is very deep and nearly level. It is well drained and can be subject to rare flooding. Permeability of this soil is moderate and runoff is slow. The soil is generally suited for dwellings and commercial buildings on well compacted and raised fill material. Larger septic tank absorption fields are usually necessary on this soil.

Bankard loamy sand soils occur on the east side of Sidney. This is a very deep, nearly level and somewhat excessively drained soil and is susceptible to occasional flooding. Permeability of this soil is rapid and runoff is slow. This soil is not suited to septic systems and is not suited for construction unless on well compacted land above the floodplain level.

A small area of Bridget very fine sandy loam exists in the east-central area of town. This is a very deep, well drained soil. Permeability of this soil is moderate and runoff is slow. Slopes on this soil are nearly level. This soil is generally suited to septic systems and the construction of dwellings and small commercial buildings.

Canyon fine sandy loam soils are found in the north end of town. This shallow, well drained soil has slopes that range from strongly sloping to steep. Permeability of this soil is moderate and runoff is rapid. This soil is generally not suited to septic systems due to steep slopes and shallowness to bedrock. The soft bedrock can generally be easily excavated for dwellings with deep foundations. Construction of dwellings needs to be designed to conform to the natural slope of the land.

Canyon-Rock Outcrop complex also exists in the north part of town. This shallow, well drained soil has slopes that range from moderately steep to steep. Permeability of this soil is moderate and runoff is rapid. This soil is generally not suited to septic systems due to steep slopes and shallowness to bedrock. Construction of dwellings needs to be designed to conform to the natural slope of the land.

Dix Gravelly loam is present in the southern part of the community. This is a very deep, excessively drained soil. Permeability of this soil is rapid and runoff is of medium speed. Slopes on this soil range from gently sloping to very steep. This soil is generally not suited to septic systems as it has poor filtering capacity. This soil is generally suited for construction of dwellings except where slopes exceed 8 percent, in which case the building site should be modified to a suitable gradient.

A couple of small pockets of the Epping-Mitchell Complex exist in the southern part of the community. The Epping soils are shallow while the Mitchell soils are deep. These soils are well drained. The permeability of these soils is moderate and runoff is rapid. Slopes on these soils range from gently sloping to steep. The Epping soils are not generally suited to septic systems as it is shallow over bedrock. This soil is generally suited for construction of dwellings where slopes have been modified to a suitable gradient. The Mitchell soils are generally suited for septic systems where slopes are less than 15 percent. In areas where slopes are greater than 15 percent, septic systems are generally not suited. This soil is generally suited for construction of dwellings where slopes have been modified to a suitable gradient.

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Glenberg fine sandy loam exists on the east side of town. This nearly level soil is very deep and well drained. Permeability in this soil is moderately rapid while runoff is slow. Flooding limits the soil's use as a septic tank absorption field. The soil is generally suited for dwellings where well compacted and raised infill is used.

Rosebud loam is found on the very north end of town. This very gently sloping soil is moderately deep and well drained. Permeability in this soil is moderate and runoff is medium. This soil is generally suited to septic systems and the construction of dwellings and small commercial buildings

Soils of the Sidney-Canyon Complex are found in the northern and northeast part of the community. The Sidney soil is deep and the Canyon soil is shallow, with both soils being well drained. Slopes range from gently sloping to strongly sloping. Permeability is moderate and runoff is medium in both soils. The Canyon soils are generally not suited for septic systems because of the shallowness of the soil. Sidney soils can be used for septic systems when modified. Both soils are generally suited for construction, although slopes greater than 8 percent need to be modified.

Sidney loam soils exist in the northeast part of Sidney. This deep soil is well drained and gently sloping. Permeability is moderate and runoff is medium. Septic systems are generally suitable on this soil when the absorption field is enlarged. The soil is also generally suited for construction although steeper slopes may need to be graded.

Alliance loam is the predominant soil at the interchange 59 area. This very deep soil is well drained and gently sloping. Permeability is moderate and runoff is medium. The soil is generally suited for septic systems where absorption fields have been enlarged. The soil is generally suited for dwellings.

The Altvan-Dix complex is the most common soil northeast of the interchange 59 area. These very deep, well drained slopes vary from gently sloping to strongly sloping. Permeability is moderate in the Altvan soil and rapid to very rapid in the Dix soil. Runoff is medium in both soils. These soils are not suited for septic systems as they have poor filtering capacity. Foundations of buildings should be strengthened and backfilled with coarse material to prevent damage caused by shrinking and swelling.

A large pocket of soils in the Canyon-Bayard complex exists to the west of Interchange 59. This shallow, well drained soil has strongly sloping to steep slopes. Permeability is moderate in the Canyon soil and moderately rapid in the Bayard soil. Runoff is medium in both soils. Septic systems are generally not suited to the Canyon soil and Bayard soils with slopes greater than 15 percent. Septic systems that are modified are suitable on Bayard soils with slopes less than 15 percent. Both soils are generally suited for construction although steeper slopes may need to be graded to a more manageable slope.

Required Energy Element

During the 2010 legislative session, LB 997 was enacted to require cities and counties to include an energy element in their comprehensive development plans that "Assesses energy infrastructure and energy use by sector, including residential, commercial, and industrial sectors; evaluates utilization of renewable energy sources; and promotes energy conservation measures that benefit the community."

Local Energy Resources

- Oil Resources and Production
- Natural Gas Resources and Production
- Wind Energy Resources
- Solar Energy Potential
- Geothermal Potential
- Biomass Potential

Oil Resources

Cheyenne County has a significant amount of oil resources as it still produces over 200,000 barrels annually which provides millions of dollars worth of economic activity. The Nebraska Oil and Gas Conservation Commission also provides economic benefits as it is headquartered in Sidney.

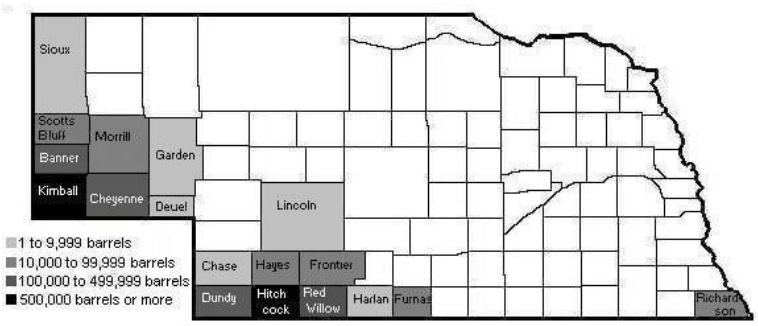
Cheyenne County was the top Panhandle oil producer as recently as 1989 and ranks as the #2 all-time Nebraska oil producer. As recently as 1986, Cheyenne County was producing 1,594,044 barrels of oil. By the year 2000, Cheyenne County oil production had fallen to 420,000 barrels. Since 2000, county oil production has fallen every year to a 2009 level of 216,267 barrels.

While this is a significant drop in production, especially from levels of production experienced in the 1950 to 1980 boom period, there is potential for the county to increase oil production at some point in the future. Advancements in drilling and completion techniques using horizontal drilling and multistage fracturing have led to renewed interest in the Niobrara oil play which is centered in Wyoming but extends to Cheyenne County.

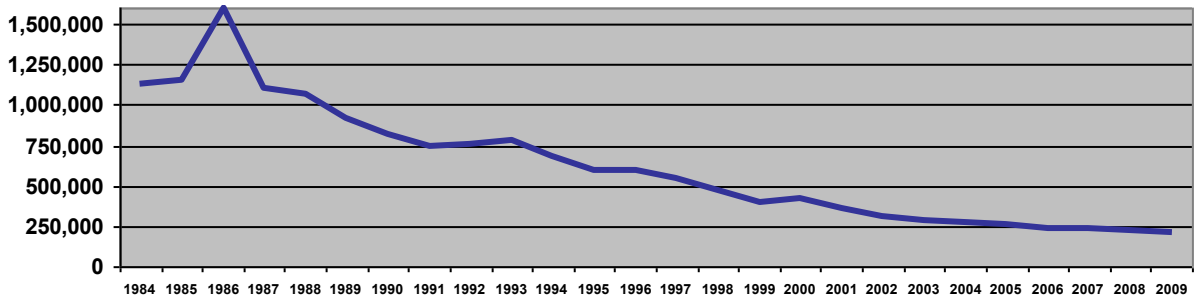
Aside from declining production rates, the local oil industry's biggest issue is occasional steep pricing discounts. Even though the price for oil is high, the static refining capacity in the United States, increased production in the Canadian Tar Sands and limited capacity on pipelines result in less demand from regional refineries for independent supplies of Nebraska oil. This issue may persist due to increased oil sands production, much of which is sent to the Suncor refineries in Denver due to a shortage of refining capacity in Alberta and the Rocky Mountain West region.

It is estimated that Nebraska consumed 42,204,000 barrels of oil in 2008. This equates to 23.5 barrels per person (nearly 1,000 gallons). Based on this ratio, it is estimated that Cheyenne County uses slightly more oil than it produces, although given the county's agricultural base, the county likely uses more fuel per capita than the state average.

Oil Production by County, 2009



Cheyenne County Oil Production, 1984 to 2009 (barrels)



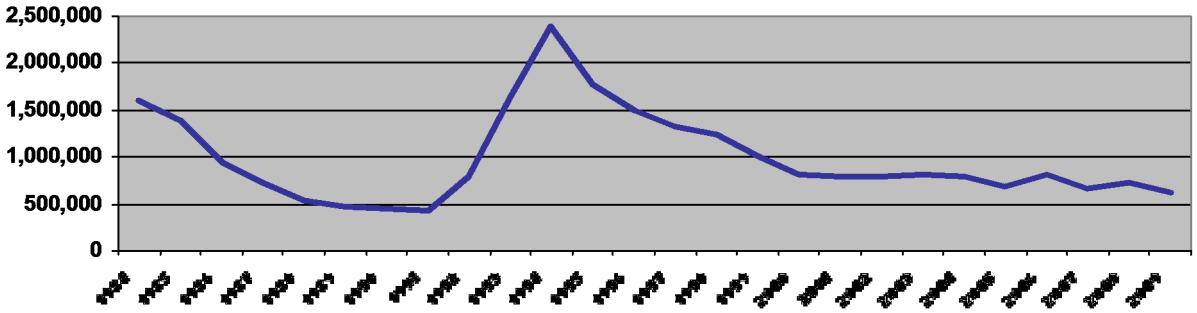
Natural Gas Resources

As recently as 2006, Cheyenne County produced about two-thirds of Nebraska's natural gas. In 1994, Cheyenne County was producing 82% of Nebraska natural gas with 2,401,085 billion cubic feet of natural gas

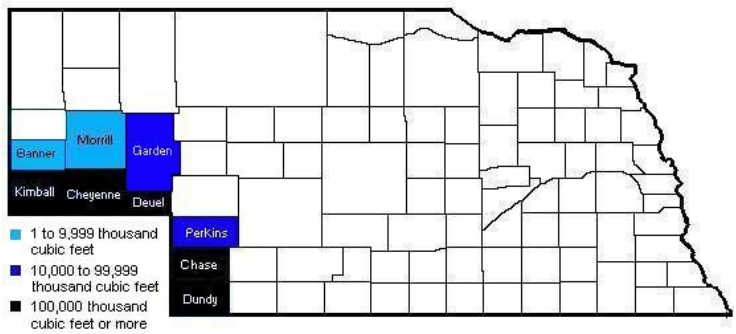
Since then Cheyenne County has slipped to third in the state in natural gas production as Deuel and Chase Counties greatly increased their output. The County still produced 618,828 billion cubic feet of natural gas in 2009 which represented more than a fifth of the state's output.

While the county may not hit the production levels it did 50 years ago, significant increases in proven reserves since 2000 and improved drilling and completion techniques hold good promise for accessing the tight natural gas formation in the county and greatly increasing output. Even with lower prices than just a few years ago, the natural gas industry will continue to bring millions of dollars worth of economic activity to the county for likely decades to come.

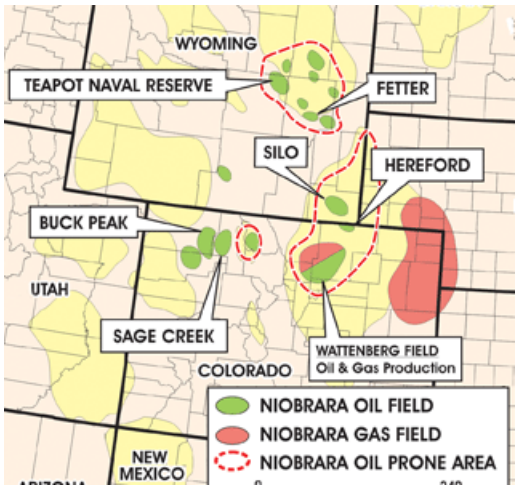
Cheyenne County Natural Gas Production, 1984 to 2009 (thousands cubic feet)



Cheyenne County Natural Gas Production, 1984 to 2009



Niobrara Oil and Gas Basin



Wind Energy

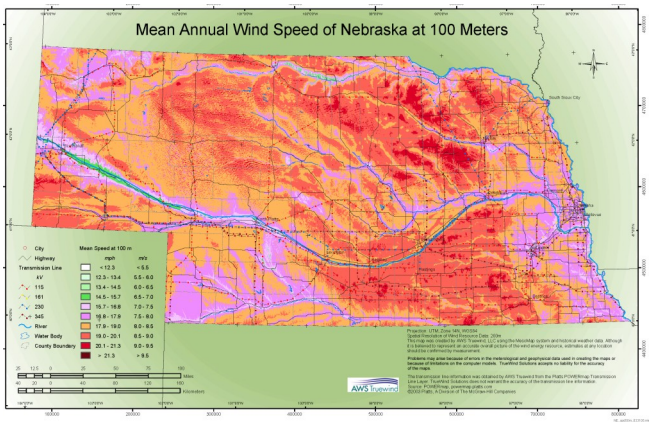
On paper, Sidney has a plethora of physical assets which should put it at the center of the wind energy production, fabrication, and assembly industries. These assets include above average wind speeds, proximity to transmission lines, a key substation that links the eastern and western grids, relative proximity to a large metro region, cheap land, an interstate highway, and two rail lines which are connected by a short line connector that provides access to an industrial park with large buildings available.

Yet, despite having basically every asset the wind industry desires, Cheyenne County does not have a single commercial wind farm or manufacturing facility.

Just to the south of the county, the wind energy industry is booming as Colorado is a national wind energy leader generating the third highest percentage of power from wind of any state. Not only can the 10th largest wind farm in the USA be seen from Cheyenne County, the state of Colorado has 1,800 megawatts of windpower on-line or under construction.

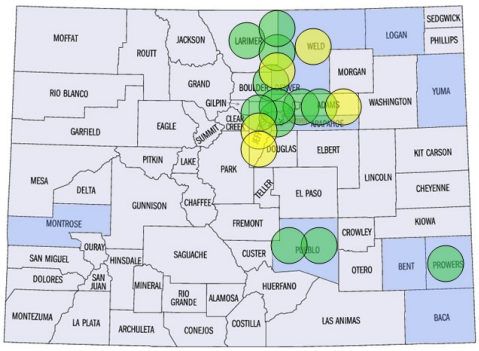
Colorado has also attracted major manufacturing investment to the state, becoming the national hub for Vestas. There are also 16 facilities in Colorado currently manufacturing for the wind industry with two other facilities having been announced.

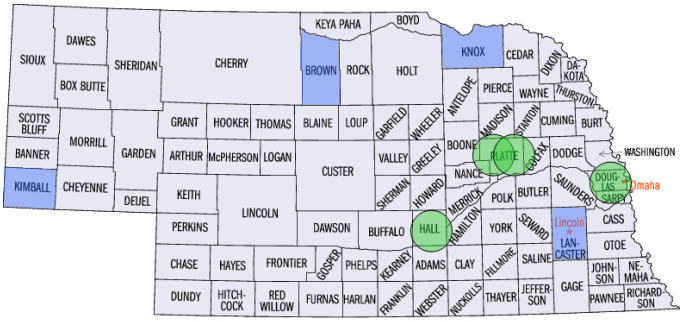
The two primary reasons the wind industry has not developed in Cheyenne County is state lines and state policy. The most notable state policy difference is that Colorado has a Renewable Portfolio Standard (RPS) while Nebraska does not have an RPS. One of the primary reasons why the large investment in wind farms has not carried over into Cheyenne County is that Colorado provides 1.2 RPS credits for projects located in Colorado while Nebraska does not provide any meaningful incentives for wind energy development. There are also many other issues such as the least cost mandate, transmission issues, and the presence of small public power districts that do not benefit from the production tax credit.



Nebraska does have incentives that would be beneficial to wind manufacturers and Sidney is close enough to the front range to be part of the wind energy manufacturing cluster which depends on timely and reliable supplies for components while also having dual rail access, interstate access, large available buildings and cheap land. Nebraska does have four wind related manufacturing plants, but they are all in eastern Nebraska.

Colorado and Nebraska wind farms and wind manufacturing

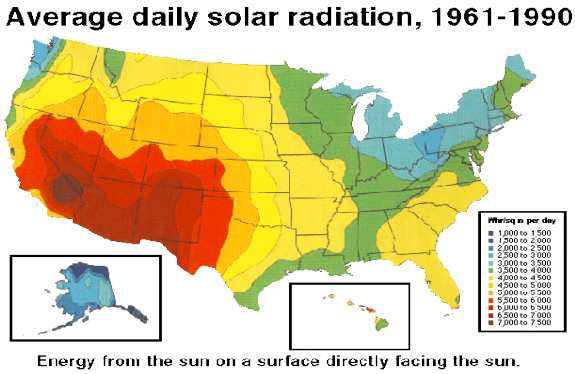




Counties with commercial wind farms in blue; manufacturing plants green and planned yellow

Solar Potential

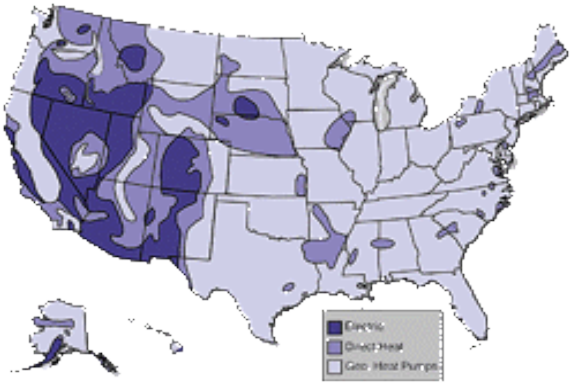
Solar energy is presently more expensive than more conventional sources of electricity. However, technological advancements are rapidly bringing down the cost of solar energy while the cost of fossil fuels are rapidly rising. Thus solar powered energy holds great promise as it may become a very feasible source of electricity production in the future.



If solar energy becomes an economically viable source of energy in the future, Cheyenne County does have good potential for solar energy. However, in the near future, smaller personal solar systems for homes and businesses are much more likely to occur in the area while commercial size operations are more likely to locate in the Southwestern US.

The greatest solar energy potential for Sidney is more likely to exist in manufacturing components for solar plants as Colorado not only has very good solar energy potential, the wind energy manufacturing cluster in Colorado could easily grow into a renewable energy cluster providing satellite component manufacturing opportunities as Colorado has many smaller solar manufacturers for residential systems.

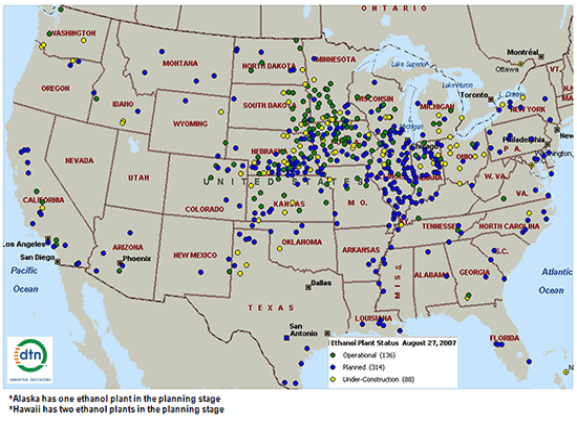
Geothermal Energy



Cheyenne County has good potential for geo-thermal energy. While Cheyenne County's geothermal resources likely would not be a desirable location for commercial production, the use for individual homes, businesses, schools, and public buildings could utilize this resource.

Biomass

Cheyenne County does not have any type of biomass production with the closest plants being ethanol facilities in Bridgeport and Sterling.



Cheyenne County does not have any type of biomass production with the closest plants being ethanol facilities in Bridgeport and Sterling.

With its excellent rail access, Sidney could feasibly facilitate a biomass facility. However, Sidney is not the most ideal site for an ethanol production site as a large share of corn would need to be shipped in and the county does not have as much livestock as many other counties in the area.

Cellulosic ethanol may be more suited for the county. However, it is not likely to be commercially viable in the foreseeable future.

Energy Consumption

- Commercial Energy Consumption
- Industrial Energy Consumption
- Residential Energy Consumption
- Renewable Energy Consumption

Energy Consumption in Nebraska's Commercial Sector

Energy consumption for the commercial sector of Sidney and Cheyenne County are not available so state figures are utilized.

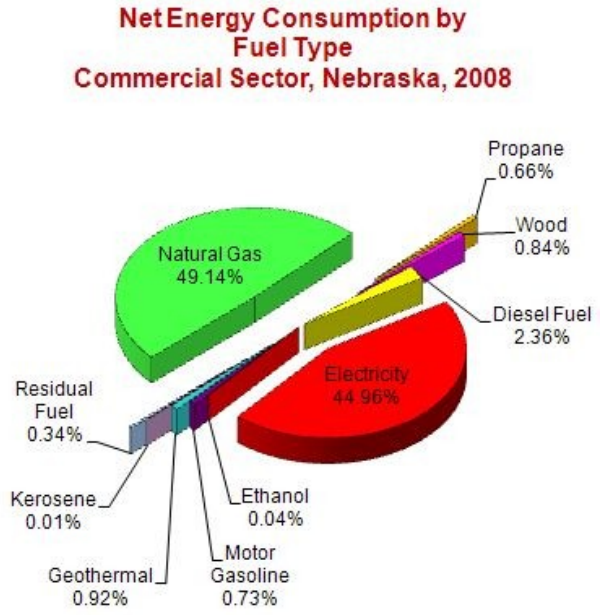
The commercial sector consists of nonmanufacturing business establishments. Included are hotels, motels, restaurants, wholesale businesses, retail stores, laundries, and other service enterprises; health, social, and educational institutions; and federal, state, and local governments. Streetlights, pumps, bridges, and public services are also included. Fuel used in motor vehicles for commercial purposes is included in the transportation sector. Examples of common uses of energy in the commercial sector include space heating, water heating, refrigeration, air conditioning, and cooking.

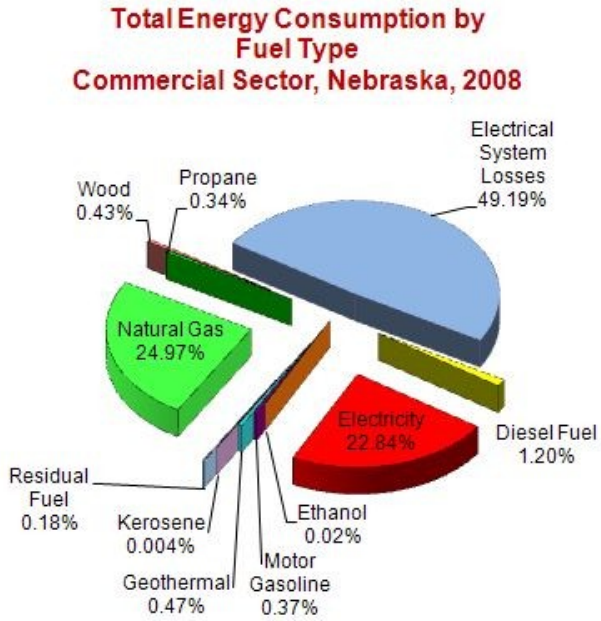
For the residential, commercial, and industrial sectors, a net total or net energy consumption (less electrical system energy losses) is provided to indicate the energy actually consumed by these sectors. In addition, energy consumed in the generation, transmission, and distribution of electricity (electrical system energy losses) is allocated to each sector based on the electricity consumed by the sector. Thus, total energy consumption represents the energy consumed by the sector as well as that used to provide electricity to the sector.

From 2007 to 2008, commercial sector net energy use increased 8.3 percent to 71.8 trillion British Thermal Units (Btu). Total energy use in the sector increased 4.2 percent to 141.1 trillion Btu. Natural gas use increased 15.0 percent from 2007 while renewable energy use increased 7.6 percent, and electricity use increased 7.1 percent. Petroleum use increased 36 percent although it comprises only 4.1 percent of the energy used by the commercial sector. Residual fuel consumption was small enough to round to zero in this table for the years 2002 and 2007. Coal consumption was small enough to round to zero in this table for the years 1998, 1999, 2000, and 2008.

In 2008, almost all (94 percent) of the commercial sector's energy needs were met by electricity and natural gas. Petroleum products made up 4.1 percent of the energy consumed in the commercial sector, and 1.8 percent was renewable energy.

Solar thermal and photovoltaic energy consumption cannot be separated between the residential and commercial sectors. The numbers are reported in the residential sector.





Energy Consumption in Nebraska's Industrial Sector

Energy consumption for the industrial sector of Sidney and Cheyenne County are not available so state figures are utilized.

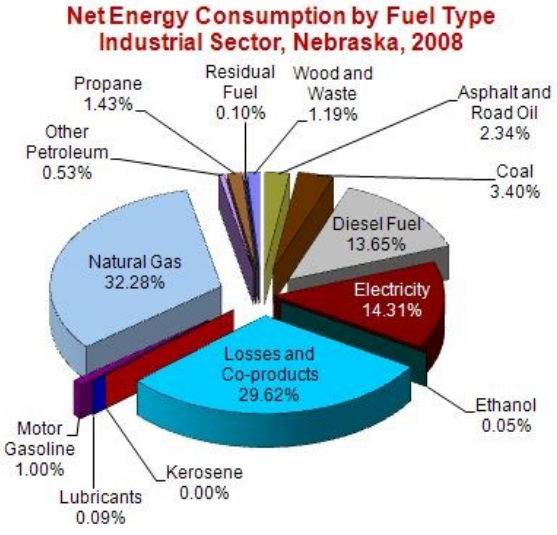
The industrial sector consists of manufacturing, construction, mining, agriculture, and forestry organizations. Energy used by this sector to transport products to market or inputs to the organizations is included in the transportation sector.

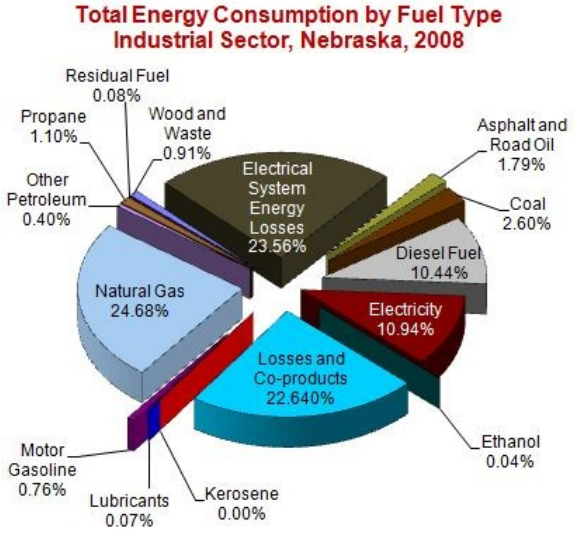
For the residential, commercial, and industrial sectors, a net total or net energy consumption (less electrical system energy losses) is provided to indicate the energy actually consumed by these sectors. In addition, energy consumed in the generation, transmission, and distribution of electricity (electrical system energy losses) is allocated to each sector based on the electricity consumed by the sector. Thus, total energy consumption represents the energy consumed by the sector as well as that used to provide electricity to the sector.

Between 2007 and 2008, industrial sector net energy use increased 9.1 percent to 229.4 trillion British Thermal Units (Btu). Total energy consumption attributed to the industrial sector in 2008 was 300.2 trillion Btu, an increase of 8.2 percent from 2007. Renewable energy use increased 37.4 percent, natural gas use increased 10.5 percent, and electricity use increased 5.7 percent from 2007. Petroleum use decreased 16.6 percent, and coal use decreased 3.5 percent. Renewable energy consumption was comprised of ethanol use, losses and co-products, and wood and waste use.

In 2008, almost all of the industrial sector energy needs were met by natural gas (32 percent), renewable energy (31 percent), petroleum products (19 percent), and electricity (14 percent). Diesel fuel (71 percent), asphalt and road oil (12 percent), propane (8 percent), and motor gasoline (5 percent) made up the majority of the petroleum products consumed by the industrial sector; the rest of the products each comprised less than three percent. Three (3) percent of the energy consumed in the industrial sector was coal.

Other petroleum products include sixteen (16) separate products, all of which are assigned to the industrial sector. The sixteen products are: aviation gasoline; blending components; crude oil; motor gasoline; blending components; natural gasoline, including isopentane; pentanes plus; petrochemical feedstocks, naphtha; petrochemical feedstocks, other oils; petrochemical feedstocks, still gas; petroleum coke; plant condensate; special naphthas; still gas; unfinished oils; unfractionated streams; waxes; and miscellaneous. Miscellaneous products vary from inexpensive (absorption oils similar to kerosene) to very expensive (hydraulic fluids) products. The greater part of the miscellaneous product line consists of finished petrochemicals, especially the aromatic hydrocarbons: benzene, toluene, and the xylenes.





Energy Consumption in Nebraska's Residential Sector

Energy consumption for the residential sector of Sidney and Cheyenne County are not available so state figures are utilized.

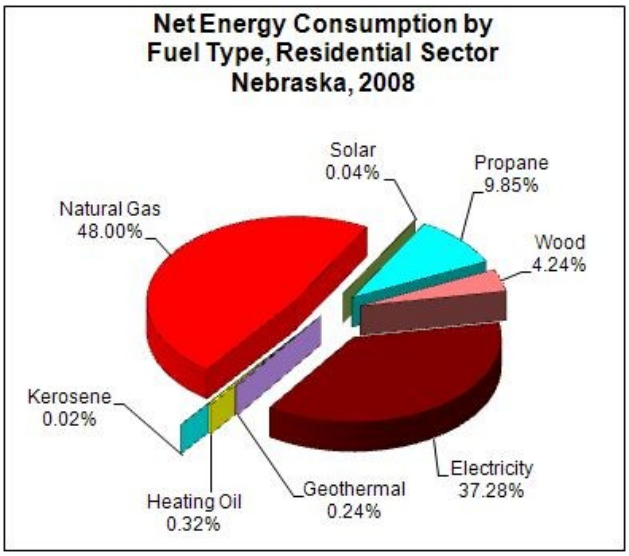
The residential sector consists of private households. Energy is consumed primarily for space heating, water heating, air conditioning, refrigeration, cooking, clothes drying, and lighting. Fuel used for motor vehicles by household members is included in the transportation sector.

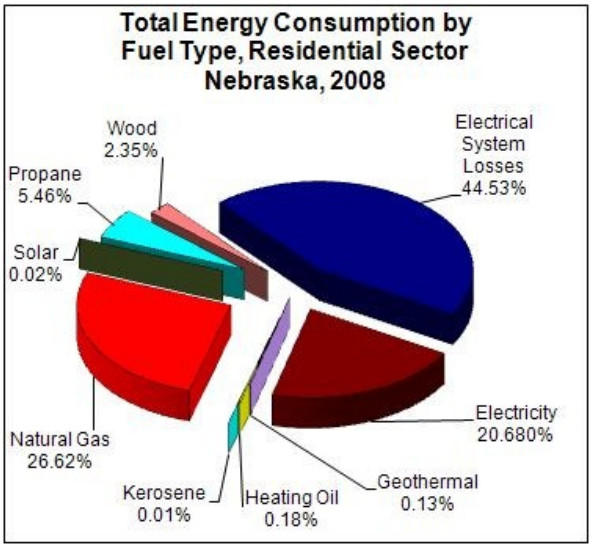
For the residential, commercial, and industrial sectors, a net total or net energy consumption (less electrical system energy losses) is provided to indicate the energy actually consumed by these sectors. In addition, energy consumed in the generation, transmission, and distribution of electricity (electrical system energy losses) is allocated to each sector based on the electricity consumed by the sector. Thus, total energy consumption represents the energy consumed by the sector as well as that used to provide electricity to the sector.

Between 2007 and 2008, residential sector net energy use increased 7.1 percent to 89.2 trillion British thermal units (Btu), which was 7.9 percent below the peak of 96.8 trillion Btu recorded in 1972. Total energy consumption attributed to the residential sector in 2008 was 160.85 trillion Btu, an increase of 3.7 percent from 2007. Renewable energy use increased 5.5 percent from 2007, petroleum use increased 31.5 percent, natural gas use increased 9.0 percent, and electricity use increased 0.02 percent while coal consumption decreased to a level low enough to round to zero.

In 2008, nearly half (48.0 percent) of the residential sector's energy needs were met by natural gas. Thirty-seven and three-tenths percent (37.3%) of the energy consumed in the residential sector was electricity, 10.2 percent were petroleum products, and 4.5 percent was renewable energy. According to the 2008 American Community Survey, 65 percent of Nebraska's households use natural gas for home heating, 23 percent use electricity, 8 percent use propane, 1.7 percent use wood, 0.85 percent use heating oil, 0.01 percent use coal, and 0.01 percent use solar energy.

The solar data below includes small amounts of solar thermal and photovoltaic energy consumed by the commercial sector that cannot be separately identified.

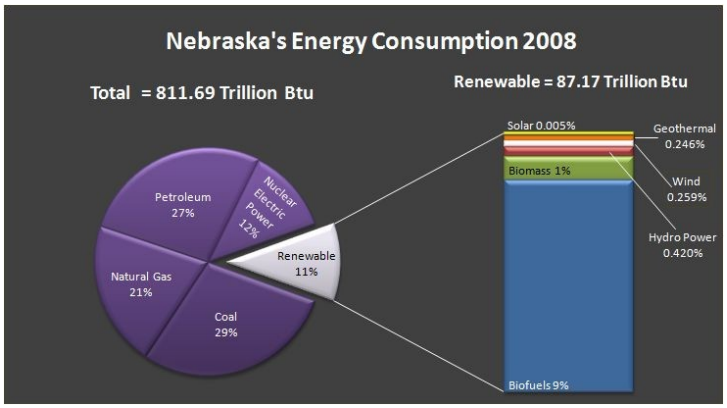




Nebraska's Renewable Energy Consumption

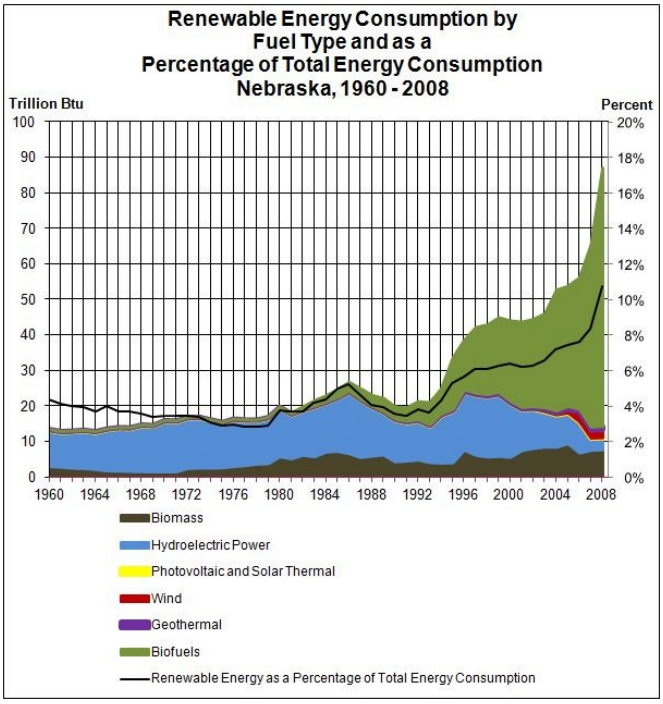
Renewable energy consumption for the Sidney and Cheyenne County are not available so state figures are utilized.

In 2008, Nebraska consumed 811.69 trillion British thermal units (Btu) of energy which included 87.17 trillion Btu of energy from renewable energy resources. Renewable resources met 10.7 percent of Nebraska's energy consumption. The percentage in 2008 was calculated differently from 2007 in order to include the energy consumption in ethanol production and the energy value of ethanol's dry/wet co-products. In 2008, Nebraska's renewable energy consumption came from biofuels, biomass, geothermal energy, hydroelectric power, wind energy, photovoltaic and solar thermal energy.



Renewable energy consumption was equivalent to 189,000 cords of wood, 346 gigawatthours of conventional hydroelectric power, 57,750,000 gallons of ethanol, 68 trillion Btu of ethanol production and co-products, 214 gigawatthours of wind energy, 876 billion Btu of geothermal energy, and 40 billion Btu of solar energy. From 1960 to 1980, renewable energy in Nebraska consisted of conventional hydroelectric power and biomass. Ethanol entered the picture in the early 1980s. Geothermal energy and photovoltaic and solar thermal energy projects were reported in the late 1980s. Wind energy projects came on line in the late 1990s. Consumption of renewable energy has steadily increased although modestly.

As a percentage of total energy consumption, renewable energy consumption was relatively stable until 1995 when the percentage began an upward climb. Biofuels had a major role in this increase. Renewable energy consumption has ranged from 2.80 percent to 10.74 percent of total energy consumption. The annual data differs from previous years' analyses due to the addition of the consumption of energy to produce ethanol and the energy value contained in the dry/wet co-products of ethanol.



This report provides the amount of renewable energy used by Nebraskans. The amount of renewable energy that generated electricity can be found in the report Annual Electricity Generation by Fuel Type.

Energy Outlook

- Transportation (Oil and Gasoline)
- Home and Business (Electricity, Coal, Natural Gas)
- Energy Codes
- Energy Conservation

Energy and Transportation

High gasoline prices place a significant impact on Sidney's residents. A recent report from the Oil Price Information Service indicates Nebraskan's spent 8.7% of their income on gasoline in April 2011.

The impact on Sidney's large commuter population is even more significant as, according to a June 2008 evaluation by the New York Times, the residents of Kimball, Morrill and Garden County spend a higher percent of their income on gasoline than the state and national average. Thus, many persons who commute to Sidney from neighboring counties likely spend more than 10% of their income on gasoline which leaves these workers with less money to spend at stores in Sidney.

One advantage Sidney has over many rural areas in periods of high fuel costs is its access to and between two major rail lines. Railroads are more fuel efficient than trucks as for every 27 gallons of diesel consumed by trucks to haul one ton of freight, railroads burn seven gallons to reach a similar distance, according to the Association of American Railroads.

While the city's rail access could provide a significant advantage for businesses if fuel costs remain persistently high from year to year, this advantage most likely would not offset the negative impacts to Sidney's existing residents and businesses as most are highly dependent on vehicles and trucks for their transportation needs. High fuel costs also diminish the City's benefits it receives from Interstate 80, especially for the travel related service and retail businesses.

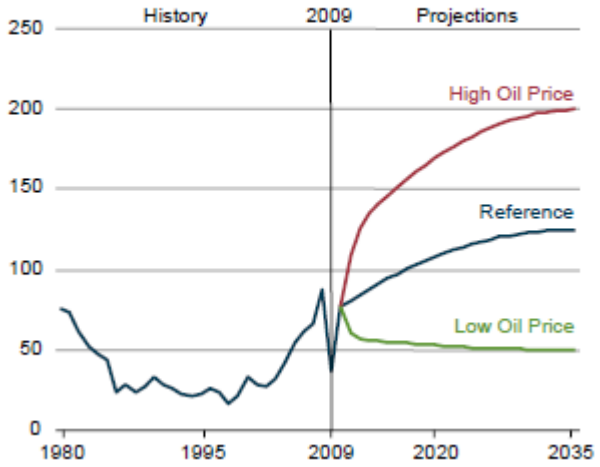
According to the Energy Information Association, average annual oil prices are expected to steadily remain above $100/bl, rising to $125 a barrel in 2030 with outlier scenarios ranging from $50 to $200. If oil price on average remain in the $100 to $125 range, Sidney would expect gasoline to be around $4 gallon.

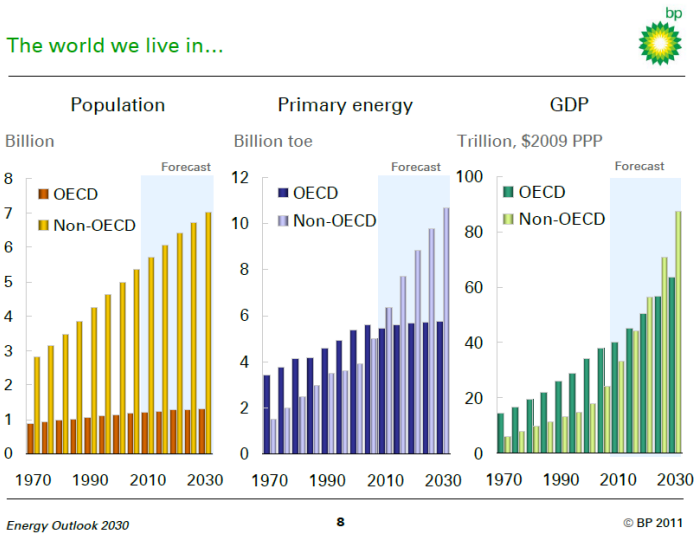
The low case scenario assumes lower demand due to GDP growth 1.5% lower than projected , uninterrupted supplies, and increased OPEC output. The high energy scenario assumes constrained supplies, GDP growth 1% higher than projected, and OPEC output is only slightly higher than forecast.

A separate report, the BP 2030 Energy Outlook, expects significant increase in world population, energy demand, and global gdp growth with a significant share of the population and energy growth coming from non-OECD countries.

Given these forecasts, Sidney should plan for a future of $3 to $4/gal gasoline prices with the potential for higher spikes. Such a strategy will prepare the community for the most likely and worse case scenarios, providing a competitive advantage over communities that do not prepare. Even if the best case scenarios are realized, Sidney will still benefit through greater energy efficiency.

Figure 13. Average annual world oil prices in three cases, 1980-2035 (2009 dollars per barrel)





Energy, Home and Business

Energy use in residential and commercial buildings represents 39 percent of all energy use in the United States which is greater than the total amount of energy used in transportation and industrial uses.

The primary sources of energy for household uses in Sidney are natural gas and coal.

Due to increased production of shale gas in the Great Plains and Appalachia, natural gas prices are expected to remain relatively flat for the next decade before modest increases in the following decade that are still well below prices experienced just a few years ago. This is good news for Sidney as these shale gas reserves should help hold down winter heating costs. It could potentially also help reduce electric costs in future decades if Nebraska electric providers increase the amount of natural gas in their portfolio.

Coal production in Wyoming is expected to continue to grow in the next 25 years which is good news for Sidney as two-thirds of Nebraska's electricity comes from coal, and for Sidney that figure is likely even higher. Due to Sidney's close proximity to cheaper Wyoming coal, the city has benefited from some of the lowest electric rates in the county.

Even though coal production in the western US is expected to rise, worldwide demand for coal is also expected to rise. In recent years the increased demand for coal grew at a faster pace than the growth in coal production and domestic coal exports. However, the EIA is expecting coal production to come in line with this growing demand in the coming decade.

Figure 89. Natural gas production by source, 1990-2035 (trillion cubic feet)

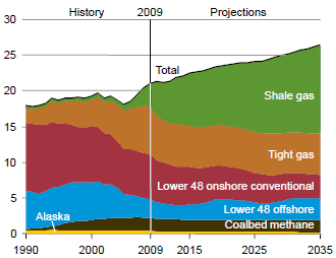
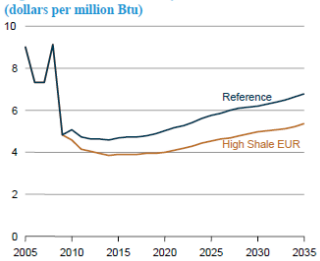
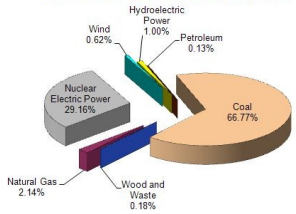


Figure 39. Natural gas prices in the Reference and High Ultimate Shale Recovery cases, 2005-2035 (dollars per million Btu)



Energy Consumption by Fuel Type
Electric Power Sector, Nebraska, 2008

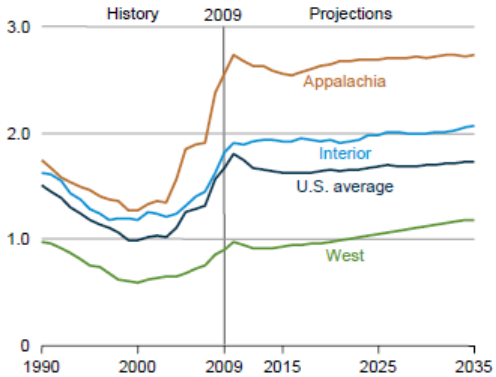


Even though coal prices have risen quite significantly in the past five years, the EIA is expecting Western coal prices to remain around current levels for the next decade before experiencing very modest increases in the following decade. The EIA also lays out coal price scenarios which range from modest declines in coal prices to very steep increases.

The adoption of a carbon tax or cap and trade scheme could add an additional 30% to the cost of coal which would obviously raise the cost of electricity.

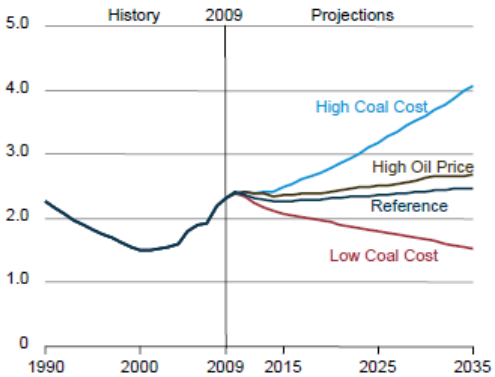
Growth in average minemouth price slows compared to recent history

Figure 103. Average annual minemouth coal prices by region, 1990-2035 (2009 dollars per million Btu)



Substantial changes in coal prices would have moderate effects on demand

Figure 104. Average annual delivered coal prices in four cases, 1990-2035 (2009 dollars per million Btu)



Energy Codes

The State of Nebraska has adopted the International Energy Conservation Code as the Nebraska Energy Code (S.S.81-1608 to 81-1616). Any city may adopt and enforce the Nebraska Energy Code or an equivalent energy code. If a city does not adopt an energy code, the Nebraska Energy Office will enforce the Nebraska Energy Code in the jurisdiction.

The purpose of the Code, under §81-1608, is to insure that newly built houses or buildings meet uniform energy efficiency standards. The statute finds

> that there is a need to adopt the . . . International Energy Conservation Code in order (1) to ensure that a minimum energy efficiency standard is maintained throughout the state, (2) to harmonize and clarify energy building code statutory references, (3) to ensure compliance with the National Energy Policy Act of 1992, (4) to increase energy savings for all Nebraska consumers, especially low-income Nebraskans, (5) to reduce the cost of state programs that provide assistance to low-income Nebraskans, (6) to reduce the amount of money expended to import energy, (7) to reduce the growth of energy consumption, (8) to lessen the need for new power plants, and (9) to provide training for local code officials and residential and commercial builders who implement the . . . International Energy Conservation Code.

The Code applies to all new buildings, or renovations of or additions to any existing buildings. Only those renovations that will cost more than 50 percent of the replacement cost of the building must comply with the Code.

The City of Sidney has not adopted the Nebraska energy code. Since the City has not adopted an energy code, the Nebraska Energy Office will enforce the Nebraska Energy Code in the jurisdiction.

Energy Efficiency Programs The City will continue to work with utility companies that supply energy to the residents and businesses of the City to promote and implement energy efficiency programs that can be utilized by these customers to improve conservation and utilization of electricity, natural gas, and other energy sources.

Residents and businesses are encouraged to work with the utility providers and take advantage of their energy efficiency programs to improve conservation and utilization of electricity, natural gas, and other energy sources.

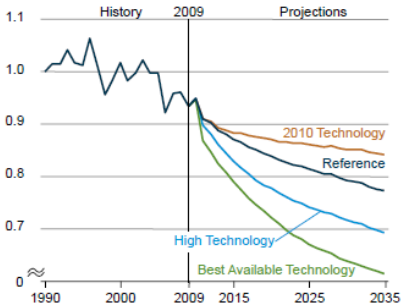
Energy Conservation

While the EIA expects aggregate energy use to increase due to a growing population, per capita residential energy use is expected to decline. The level of decline will be determined by the level of technology utilized by consumers.

This helps illustrate the importance of Incorporating energy efficiency and conservation, as they are the best path toward reducing energy use and costs.

Residential energy use per capita varies with end-use technology assumptions

Figure 58. Residential delivered energy consumption per capita in four cases, 1990-2035 (index, 1990 = 1)



The Nebraska Energy Office has listed ways to save money on energy bills for the home, farm, business, or vehicle. Options for energy savings are listed on the Office's web site at http://www.neo.ne.gov/tips/tips.htm. The City and residents and businesses in the City are encouraged to take advantage of the conversation measures.

Strengths
- Sidney has an attractive semi-arid living climate

- Sidney has many assets that are conducive to developing a local wind energy industry

- The flood reduction project has greatly reduced the potential for severe flooding

- Lake McConaughy is close enough for locals to enjoy summer water recreation

- The new wellfield water project provides the City with a more reliable source of potable water

- One of the largest concentration of trees in Cheyenne County occurs within the City of Sidney.

- Sidney is located in the Mountain Time Zone which is a favorable benefit to sports fans

- Most of the soils in Sidney are generally suited for development

- An abundance of local employment and higher incomes enables Sidney residents to pay a lower percentage of their income on gasoline than other areas in rural Nebraska.

- Cheyenne County benefits from producing and transporting energy
  - Cheyenne County is one of Nebraska's leading oil production counties
  - Cheyenne County is one of the leading natural gas producers in Nebraska
  - The state oil and gas commission is headquartered in Sidney
  - The distribution of coal creates many railroad jobs

- Sidney's proximity to cheap Powder River Basin coal in Wyoming has kept electric rates low

- Sidney has access to natural gas which provides affordable source of winter heating for homes and businesses. Recent and projected growth in domestic shale gas should keep heating costs relatively affordable.

- Sidney's access to and between two major rail lines provides an advantage to businesses in a high energy cost environment

- A large renewable energy manufacturing cluster has developed along the Front Range

- Cheyenne County has good geo-thermal potential

Weaknesses
- Sidney is not within commuting distance of a metropolitan city

- Sidney is a long distance from its state capital

- The Brule Formation generally yields only small amounts of water to wells and is susceptible to . rapid declines.

- Despite recent wet weather, groundwater level have fallen in the past decade

- Some of the newer parts of Sidney have very few mature trees

- Some soils in Sidney have steep slopes creating issues with water runoff while other soils on Sidney's periphery are not well suited for septic systems.

- The local oil industry is occasionally hit with steep pricing discounts.

- Cheyenne County produced a significant share of its oil supplies decades ago when oil prices were much lower

- The State of Nebraska has done very little to stimulate wind energy in Cheyenne County

- Colorado provides local utilities additional RPS credits for wind energy projects located in Colorado reducing the incentive for Colorado developers to build wind farms in Nebraska

- Many commuters spend a high percentage of their income on gasoline reducing the amount of disposable income they can spend in Sidney

- Most of the products Sidney residents consume have to be transported long distances

Opportunities

- Advancements in drilling and completion techniques using horizontal drilling and multistage fracturing have led to renewed interest in the Niobrara oil play which is centered in Wyoming but extends to Cheyenne County

- Horizontal drilling and multistage fracturing will likely increase natural gas production

- Preparing for a future of high energy costs is a win-win proposition.
  - Provides a competitive advantage over less prepared cities if this likelihood does become reality.
  - Saves energy costs even if future energy spikes do not materialize

.

- Producing energy will likely be one of the greatest economic development opportunities for rural areas in the coming decades.
    - Cheyenne County's natural gas and oil resources should bring millions of dollars into the local economy

- Increased demand for coal and increased use of rail for long-haul cargo will likely create additional railroad related employment opportunities in the area.

- Renewable energy has become a bigger part of the United States' energy portfolio and will likely continue to account for an increasing share of our country's total supply in coming years.
  - Nebraska ranks sixth in wind energy potential
  - Sidney could potentially become part of Colorado's large and growing renewable energy manufacturing cluster
  - Sidney has many assets that are well suited for the wind energy industry

Threats

- Sidney is very susceptible to droughts

- Many areas in Sidney experience localized flooding during heavy rains

- Severe, damaging hail storms are not uncommon in Sidney

- Many energy experts are projecting a future of higher energy costs

- High corn prices, water shortages and increasing national criticism could temper future growth of biofuels

- Worldwide oil demand has been increasing while world oil production has been flattening
    - Much of the increase in world-wide energy demand is coming from the developing countries

- The Panhandle's large reliance on coal for electricity could lead to high electricity rates in the near future
  - The growing worldwide demand for coal may lead to much higher domestic coal prices
  - An increasing amount of Wyoming's coal is expected to supply the east coast
  - Carbon trading/tax schemes could add 30% to the cost of coal