



Turbine Manufacturing

Industry Opportunities in

Casper - Natrona County, Wyoming



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EXECUTIVE SUMMARY

Casper and Natrona County, Wyoming are an especially attractive location for plants that manufacture turbines.

This has been documented by BFPC, LLC, a leading site selection and location strategy consulting firm. BFPC recently completed an in-depth investigation of the Natrona County economy. One key purpose of the study was to identify industries and business operations that can benefit from the unique business advantages of the Casper area.

Turbine manufacturing was selected for its particular ability to take advantage of business and other conditions in Casper and Natrona County. This important industry which manufactures next-generation electrical generating equipment is growing at 30% to 40% per year.

Reasons for selecting the turbine manufacturing business as a target include the following Casper area assets:

- Selected business costs nearly **16% below typical or national average costs for turbine manufacturing facilities**. Projected costs for staffing, construction, utilities, and certain other expenses to establish and operate a turbine manufacturing plant in Casper and Natrona County are well below the comparable US national average.
- **Complete absence of taxes on corporate and personal income** as well as **absence of many other taxes** (such as inventory) which manufacturers find annoying in other locations. The total state and local tax burden in Casper and Natrona County is one of the lowest in the US. Wyoming ranked first in the entire nation in the 2008 State Business Tax Climate Index study prepared by the highly respected Tax Foundation (<http://www.taxfoundation.org/press/show/22660.html>). Wyoming sales and use taxes are also low and not applicable to many materials related to manufacturing. Further, since Wyoming often has the lowest debt of any state, the likelihood of maintaining this extremely low-tax environment is very promising.
- Above average **availability of personnel experienced in manufacturing machinery and equipment, metal fabrication, and related industries**. This is due to a well-established industrial base, (over a thousand people currently work in these areas in Natrona County), local industrial training facilities, the strong local population growth rate, and the attractiveness of the community and state as a relocation destination.
- **Large potential regional customer base**. The Rocky Mountains/Inland West is one of the fastest-growing regions of the in US, both in population and in business development. It has an especially large potential for growth of its wind energy business, due to its consistent wind flows, availability of suitable land, and other strengths. Wyoming has been the location of commercial wind farms for over a decade.

- **Excellent transportation.** Interstate Highway 25 bisects Casper and Natrona County, and the community has several other major highways. A main BNSF rail line and yard also serve the community. Casper/Natrona County International Airport has the largest volume of commercial service in the state including daily non-stop flights to and from Chicago, Denver, Las Vegas, Minneapolis, and Salt Lake City.
- **A state right-to-work law and other components of Wyoming's strong business climate.** Wyoming has consistently ranked high in the annual study of pro-business characteristics by Pollina Corporate Real Estate, placing 5th in the nation in 2008. Forbes Magazine, American City Business Journals, and many other well regarded independent organizations have given outstanding marks to Casper and Wyoming.
- An attractive **package of industrial development incentives.** More information is available from the Wyoming Business Council (<http://www.whywyoming.org/>).
- A **growing local business and industrial sector.** Casper and Natrona County have Wyoming's largest and fastest growing manufacturing base, health care industry, and other business components.
- A **quality of life that supports recruitment, transfer, and maintenance of staff.**
 - A magnificent physical environment on the edge of the Rocky Mountains with scenic vistas, numerous outdoor recreational opportunities, an average of 275 sunny days per year, and lots of wide open spaces.
 - A strong local business community with a historic and vibrant downtown.
 - Local entertainment and culture such as the Casper Ghosts baseball team and the Nicolaysen Art Museum, a major center for contemporary artists in the Rockies.
 - Casper College, with its unusually broad range of academic, business, technical, career, and personal advancement programs.
 - Access to sophisticated urban services. Many like the idea of living in the smaller urban environment of Casper with an occasional weekend in Denver.

More data about Casper and Natrona County
and the region's advantages for your company are available from the



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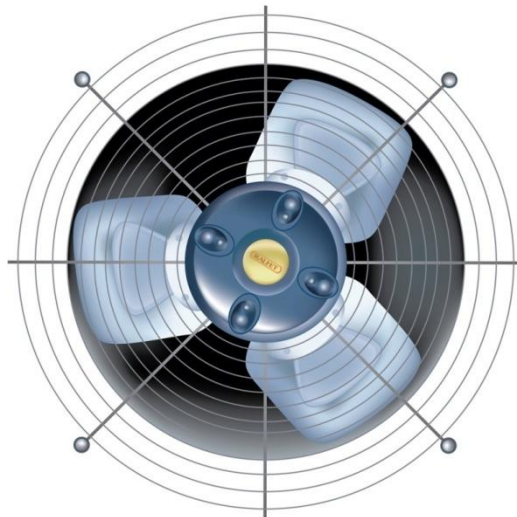
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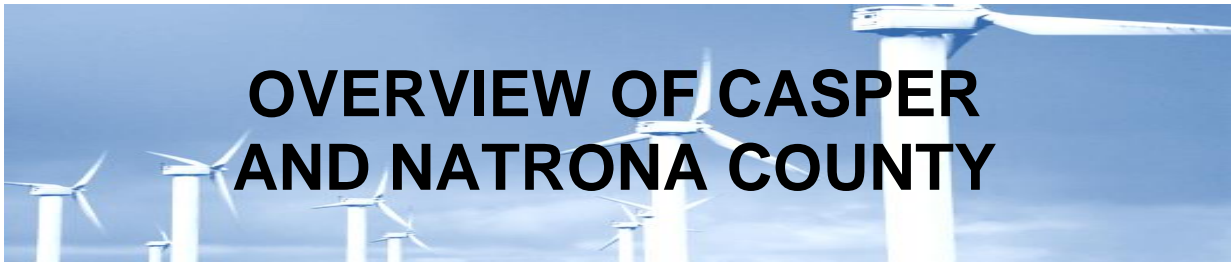


The leadership of Casper and Natrona County is committed to expanding and diversifying the regional economy. As part of that goal, the Casper Area Economic Development Alliance has begun a new campaign to market this area as a location for businesses and industries that can profit from its appealing features.

BFPC, LLC, a major international site selection and location consulting firm, has been retained to provide professional counsel to this program. It was charged to identify specific business activities that are a particularly good fit with the locational attributes of Casper and Natrona County, and which might benefit by establishing a facility in the community.

The study concluded that Casper-Natrona County is an especially appropriate and attractive location for facilities which manufacture turbines and related equipment, especially those which use wind power to generate electricity. This report provides details and makes a strong business case why companies in this industry should consider the Casper area.





OVERVIEW OF CASPER AND NATRONA COUNTY

Community Description

Casper, Wyoming's fastest-growing metropolitan area is located along I-25 in the east central part of the state. It is about a 2 ½ hour drive north of Cheyenne, the state capital and northern edge of the Front Range Urban Corridor centered on Denver. The current population of Natrona County, which forms the Casper metro area, is estimated at 75,000 and represents growth of over 10% since 2000, well ahead of the national rate.



The City of Casper is an attractive and vibrant urban center whose population is around 56,000. It has a healthy central business district with architecturally interesting historic structures and stately houses, as well as new office and commercial structures. Other communities in Natrona County include Alcova, an outdoor recreational area southwest of Casper; Barr Nunn, Evansville, and Mills located adjacent to Casper; and Edgerton and Midwest, located near each other in northeastern Natrona County. The western part of the County is very scenic and contains significant historic

sites such as Devil's Gate and Independence Rock but is lightly populated.

Casper and Natrona County lie along the eastern edge of the Rocky Mountains, near their boundary of the Great Plains. Its elevation is about a mile above sea level. Nearby mountains exceed 8,300 feet. The regional climate is characterized as semi-arid, with an average of a foot of liquid precipitation per year and an annual average of 275 sunny days. Winter storms can be intense but tend to be brief, with snow rapidly melting away.

Casper is often regarded as the community most typical of Wyoming, with its unique combination of wide open spaces, magnificent scenery, optimistic frontier spirit, strong business climate and robust economy. It has become a major center for professional and technical support of the State's huge energy business; the US Energy Department's Rocky Mountain Oilfield Testing Center is located here. It was the first community in Wyoming to be designated a metropolitan area which symbolizes its economic importance, quality of life, and range of services to support business and personal needs.

Its infrastructure is well developed; Qwest points out that its telecommunications systems in Casper are equal to that in Denver. The health care sector in Natrona County is the state's largest and fastest-growing. Casper/Natrona County International has the largest number of commercial flights in Wyoming, offering nonstop service to and from Chicago, Denver, Las Vegas, Minneapolis, and Salt Lake, by Allegiant Air, Delta, Northwest, and United Airlines. Mike Lansing Field is home of the Casper Ghosts baseball team, a farm team of the Colorado Rockies.

While Casper enjoys its frontier image, it has an increasing association with the Denver area, whose growth is clearly moving rapidly up I-25 into Wyoming. A recent article in The Next American City Magazine (<http://americancity.org/magazine/article/wyoming-metropolis-crane/>) describes this trend and notes the study of high-speed rail service along the Front Range Urban Corridor that may eventually connect Casper with Denver and even Albuquerque. Many people are pleased with living in a smaller metro area such as Casper, interspersed with an occasional weekend in Denver.

Wyoming's business climate and policies to support the private sector are among the nation's best. It has ranked among the top six states in every annual survey of pro-business attitudes conducted by Pollina Corporate Real Estate, Inc., placing 5th in 2008, highest of any state outside the south-east. One reason for Wyoming's aggressive business development attitude is acknowledgement that it is not the first place that comes to mind for businesses thinking about siting new facilities. Like sunbelt states a few years ago, Casper and Wyoming must work hard to attract the attention of expanding companies.

Fortunately, it has the resources to accomplish this goal. Public affairs in Wyoming are managed by one of the most effective, least cumbersome state governments in the nation. The state's small population leads to a refreshing size and scale of government. Elected officials are generally known personally by and held accountable to the citizens. Wyoming's success in a variety of governmental goals—economic growth, financial prudence, intelligent expenditures of public funds on the right things—is the envy of many other states.

Economic Development Trends

Casper started in the 1840's as a waypoint along the Oregon, California, and Mormon Trails. The Laramie Mountain Range extends from the Wyoming-Colorado border north to Casper Mountain, just south of the city. This chain causes the North Platte River to make a sweeping northerly arc before it turns east to cross the Great Plains and connect with the Missouri River near Omaha. The northern point on that arc—today's Casper—was the logical place for pioneers coming from the east to leave the Platte River Valley and head overland, westward across the South Pass of the Rocky Mountains. Casper was visited by a half-million immigrants, some of whom decided to stay.

Casper and Natrona County were established as local governments in the 1880's when the first railroad from the east reached the area. Casper's initial business activities were based on agriculture, primarily ranching and sheep-raising, and many remain in business today. Lou Taubert Ranch Outfitters, a landmark of downtown Casper for nearly 90 years, was founded to serve the region's farmers and ranchers, as well as to sell locally manufactured products such as saddles and other leather goods.

Oil was discovered around Casper in the late 1800's, about the same time the automobile became practical, leading to development of a state economy heavily influenced by the global demand for petroleum. This led to many advantages. For example, the state's current revenue from energy and



mining is so great—roughly a billion dollars per year, second only to Texas—and its rate of increase is so rapid, that Wyoming’s state and local tax burden is the nation’s lowest, just 4.4% of income. (<http://eadiv.state.wy.us/wef/Outlook2007.pdf>). It imposes no corporate or personal income tax and does not have many taxes of the type found to inhibit business activity in other states. Wyoming is ranked first in the nation in the Tax Foundation’s 2008 State Business Tax Climate Index (<http://www.taxfoundation.org/press/shows/22660.html>).

Having been provided with a wealth of natural resources, Wyoming is credited with sensible management and investment of these funds. By law, a 1.5% severance tax on minerals is deposited into a trust fund whose principal (currently in the \$3 billion range) is virtually untouchable. Only the interest may be used, and most observers concur that it is wisely invested. Education, for example, has been a beneficiary. Over 90% of the age 25+ population of Natrona County has a high school education or more, second-highest in the US and nearly 7 percentage points greater than the national figure. Via the Hathaway Scholarship program and other state aid, qualifying Wyoming high school graduates can obtain a college education at little or no cost.

At the same time, a realistic attitude prevails about the flow of mineral-based revenue. The large


presence of the energy business has caused rapid economic decline in Wyoming at times when the demand for oil decreased. Economic diversification has thus become a major initiative for the state.



Casper is clearly on the leading edge with its aggressive policy of expanding into other economic sectors. It already has the State’s largest concentrations of finance, manufacturing, several areas of health care, and other fields. The Wyoming Medical Center, the State’s largest hospital, and more than 200 other Natrona County health care facilities provide a wide range of

medical and related services to consumers over a broad geographic area, and are also a key part of the economy. Casper also is a center for professional and technical services.

This report is part of a comprehensive campaign by the Casper Area Economic Development Alliance to continue to attract a wider range of business activities. The following pages make a strong business case why Casper and Natrona County are an especially attractive location for specific sectors, including facilities that manufacture and assemble turbines and related electrical generating equipment.



ADVANTAGES OF CASPER AND NATRONA COUNTY AS A LOCATION FOR MANUFACTURING TURBINES AND GENERATING SYSTEMS

Casper and Natrona County comprise a particularly attractive location for facilities that manufacture and assemble turbine-based electrical generating equipment, and especially wind turbines. This section begins with a concise review of certain business conditions and trends in the wind energy industry. It then points out how Casper and Natrona County are especially well suited to serve many of the industry's needs and objectives.

Overview of the Turbine Manufacturing Industry

The industry envisioned in this report is primarily engaged in manufacturing the high technology equipment which generates electricity from wind. This is the most rapidly growing part of a larger industrial category which includes all types of turbine equipment.

Industry Definition. Turbines use the flow of gas or liquid to move a physical component such as a blade or fan. The blade's movement is transferred in turn by a rotating shaft or other mechanical linkage to a device that does useful work. Common sources of energy for turbines include the gravity flow of water, as in a hydroelectric dam, combustion of a fuel such as oil or gas whose heat creates flow expanding compressed air, conversions of water into steam by combustion or nuclear energy, and wind. It is also possible to use turbines to extract power from more unconventional sources such as the ebb and flow of oceanic tides. The concept is old, windmills and water wheels have been used for centuries; but there have been huge leaps in technology recently. The great majority of the world's electric energy is generated by some type of turbine.

Production of turbines is designated NAICS Code 333611, a business which employs about 18,000 persons in 140 US plants and has an annual output valued in the \$18 billion range. Large plants, commonly using coal-fired steam turbines, often make sense as an economy of scale, but generation capacity has become much more diversified and distributed. In the energy crisis of the 1970's, the US passed legislation that encouraged generation of electricity by sources other than the utilities' own plants and allowed such energy to be interested back into the national power grid. Thus there has been a proliferation of smaller plants powered by wind, natural gas, low-head hydro (small dams), and other energy sources.

The wind turbine/wind generation sector is the fastest growing; 13 new manufacturing plants were opened or announced in 2007 according to the American Wind Energy Association. Environment News Service estimated that \$14 billion was spent globally on wind turbine equipment in 2005 (<http://www.ens-newswire.com/ens/feb2006/2006-02-23-04.asp>).

Wind Powered Turbines. The area of greatest turbine growth is wind-based electricity generation. It is clean, as there are no combustion by products, hazardous wastes, or greenhouse gases, and it usually has a low impact on other aspects of the environment. It does not involve consumption of fuels, desirable from a cost standpoint as well as promoting national energy self-sufficiency. It can help balance the nation's electric distribution grid since such plants are usually smaller and more geographically dispersed than the relatively few large coal, nuclear, and hydro plants that traditionally comprise most of the nation's generating capacity. While wind farms may require a fair amount of land, most of that is for buffering; the actual occupied "footprint" may be less than 1% of the land area, so wind farms do not necessarily remove land from other compatible uses such as farming or ranching.



In the past, wind energy was less feasible because the technology and efficiency was low. It could be used on a standalone basis – for example to recharge batteries using low-voltage direct current – but the electricity it generated was often not of adequate quality and reliability to feed into power lines. It could not compete with the easy availability, proven technology, and low cost of electricity generated by large plants feeding the national power grid.

In recent years, however, wind energy has become vastly more practical and economical due to R&D which produced many advances, as well as large cost reductions. The expense of petroleum fuels has increased. There are also federal tax incentives and favorable policies by some large customers (eager for a "green" image) that improve the economics of wind energy.

There are two general categories of wind-powered turbine systems: "fan" style units whose axis of rotation is horizontal and "eggbeater" style units that rotate around a vertical axis. Both have many practical applications and are likely to see expanded use.

Horizontal- Axis Turbines are usually more efficient in the amount of electricity they generate for a given wind speed. However, they are often very large and require mounting and an elaborate tower structure. Blades can be 100-150 feet long; thus the towers must be at least another 100 feet taller or more to provide clear rotating space and safety margin above the ground. Their size makes transporting and installing them more complicated and expensive.

This style of wind generating equipment requires an elaborate control system. The blade assembly must be physically rotated to face the direction from which the wind is blowing; this necessitates sensors and additional mechanical equipment. Many horizontal-axis units are capable of varying the pitch of the blades to optimize their ability to catch the wind at various speeds and also to stop rotation if wind exceeds a safe operating speed. The turbine itself is almost always mounted at or near the axis of rotation; this means that it may be 200 feet above the ground, which presents access challenges for maintenance and adjustments.

The speed of wind can vary a great deal over short vertical distances, usually becoming greater and more regular as height above ground increases. It is an asset for fan-operated turbine systems to be tall in order to gain access to faster and more stable winds. Uneven wind speeds at different points in the rotation cycle means that the blade structure is stressed and subject to damage over time. The mix of features suggests that when horizontal-axis turbine sets are chosen, the economies of scale favor a large number of large units. Some locations are well suited for wind farms of this scale and Wyoming is clearly one of them. With its wide open spaces and reliable wind, it has already proven a successful environment.

Vertical- Axis Turbines start with the advantage that they can extract energy from the wind regardless of its direction. Consequently they do not need a mechanism to turn as wind direction changes and so are less complicated and lower-maintenance. Their moving parts usually rotate through a much smaller radius than the 100 foot plus arc of a fan-type blade so they are more compact and usually not as high. Their turbine and mechanical parts are usually at the base of the vanes rather than on top of a 200 foot pole so they are easier to access for repairs and adjustments.

Their smaller size and less complex operation allow them to be installed in places where a low visibility profile is necessary, such as on top of a downtown office building. In fact, clever designs allow for placing vertical-axis turbines where they take advantage of the “urban canyon” wind currents, well known to pedestrians walking around clusters of tall buildings.

Wind-generated electricity is clearly on a roll. It is by far the most rapidly growing form of energy generation in the US, expanding by 30% to 40% per year according to the US Energy Department. The American Wind Energy Association states that capacity currently installed in the US is about 17,000 megawatts. AWEA notes that wind energy provides up to 25% of generation in parts of Europe and believes that it could provide 20% of US electricity needs.

A fascinating aspect of wind turbine generating systems is that they can be installed at virtually any size and scale. Some large-scale wind farms are operated by major utility companies. FPL Energy operates 47 wind farms in 15 states including Wyoming with a total generating capacity over 4,000 megawatts. Some commercial wind farms have a generating capacity of over 700 megawatts, the equivalent of a large coal-fired plant. Many other established utilities are eager to enter or expand their presence in this rapidly growing field of commerce.

Much of the current demand for turbines, however, is for use by organizations that are not primarily in the utility business. A wind turbine (particularly the smaller, less obvious vertical axis systems) can often be inconspicuously tucked into industrial sites, office buildings, college campuses, and other facilities, and make a considerable reduction in the electricity its owner must purchase from commercial sources. Also, improvements in their electrical and electronic aspects allow wind turbine systems to generate electricity compatible with that on the grid so that it can be sold back into the national system when the owner does not need it for its own purposes. A factory that installs a wind turbine to provide lower-cost supplemental electricity for one shift can run the unit during other shifts and make money from it.

Wind power development is set to boom in the near future due to the rising price of petroleum products and the need to limit emissions linked to global warming.

-Environmental News Service

The cost of wind-generated electricity has dropped dramatically. According to FPL Energy, it has gone from about 30 cents per kilowatt to 4.5 – 7 cents over the last decade. This is still higher than some conventional generating methodologies but the cost differential is now much lower. The price of wind turbine electricity may well do just as computer power has done, continuing its rapid cost drop based on improved technology and wider usage.

The conclusion of this brief analysis is that there are strong market demands for a broad range of wind turbines. Wind-generated electricity has many advantages and has become a proven technology. There is a rapid expansion of capacity in the US and globally, which is being undertaken by large utility companies and private businesses, and sometimes even individuals. Thus there is a very robust market for a wide range of wind turbine equipment.





Why Locate a Turbine Plant in Casper-Natrona County?

Casper and Natrona County are particularly well suited as a location for manufacturing and assembling turbines. This is due to a combination of local conditions and a diligent effort by the community to welcome new manufacturers and provide an operating environment that allows them to prosper. BFPC has summarized up the key locational advantages of Casper and Natrona County into the following five categories:

1. Favorable Economics. A turbine plant in Natrona County can save nearly 16% relative to the US average for the industry. This asset is so compelling that it deserves more detail, which is provided in the following chapter.

In addition to direct cost savings, manufacturers in Wyoming benefit from the State's lack of taxes on income and many other assets and revenues often taxed by other jurisdictions.

2. Availability of a Skilled Workforce. The design and manufacture of turbines needs a specific set of skills. It calls for people with experience in fabricating machinery and metal equipment. It also requires that these individuals be flexible, innovative, and adaptive in order to meet the widely varying demands of the turbine market. It needs people who understand how the mechanical equipment must be integrated with computerized control systems. And finally, it needs people who will combine these capabilities with a can-do attitude and accomplish the job assigned to them.

Casper-Natrona County is better prepared than many other locations to offer a pool of qualified employees to a new turbine plant. Reasons for these assets include its strong population growth, the high percentage of high school graduates in the State's working-age population, Wyoming's well-regarded industrial training programs, and the established local pool of experienced people. In fact, over a thousand people already work in existing Natrona County machinery and fabrication plants. It is also possible to recruit skilled people from outside the area. Wyoming was cited along with other western states as a popular relocation destination for ambitious young people in a recent USA Today article.

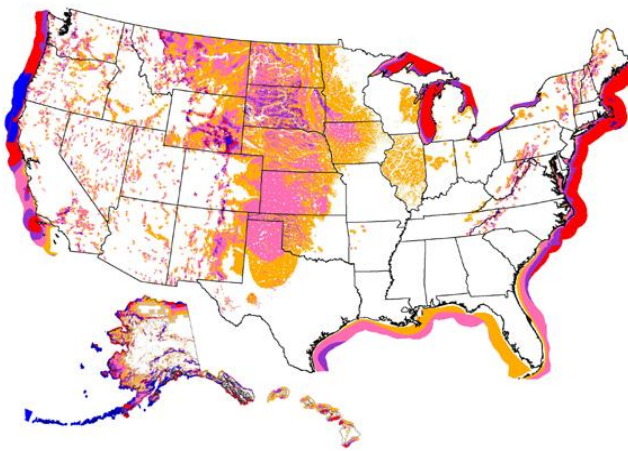
(http://www.usatoday.com/printedition/news/20071130/1a_lede30dom.art.htm).

In 2006, almost 50 million people, or 16.2% of Americans, had changed residences in the previous year. Most of the draws for out-of-state movers are in the West. Destinations included Nevada – the state with the fastest-growing population throughout much of this decade – Alaska, Wyoming, Idaho, Arizona and Oregon. -USA Today

The Wyoming workforce's frontier spirit and take-charge attitude are big assets to manufacturers. The value added per Wyoming manufacturing production worker is one of the highest in the nation. Like most sunbelt states, Wyoming has a right-to-work law; only 6.1% of its private sector employees

are labor union members. It consistently ranks as one of the lowest states in the nation for percentage of families below the poverty level, partly a function of its strong economy but also a reflection of a strong work ethic and sense of personal responsibility. (Data in this paragraph from the 2008 US Statistical Abstract, <http://www.census.gov/compendia/statab/>).

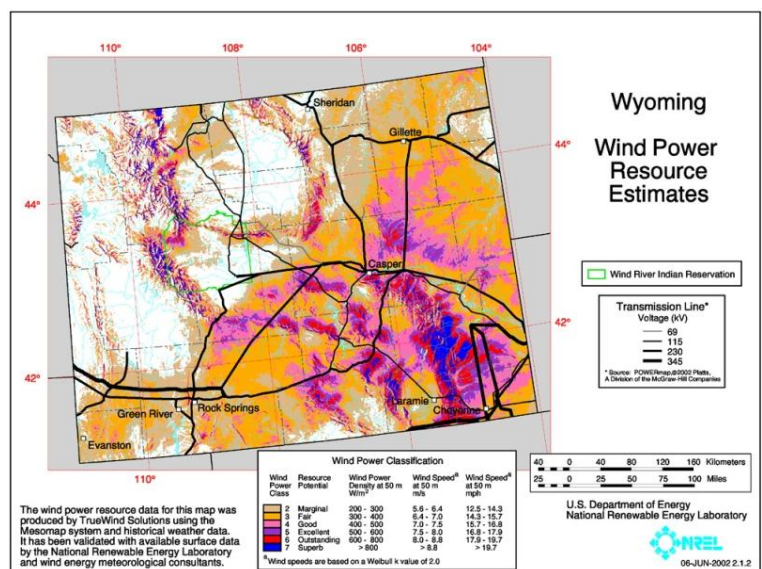
3. Public Policies. Wyoming believes that one of the characteristics most attractive to business is to maintain a fiscally sound public sector which does a good job on the essentials of government and then gives people and businesses as much freedom as possible to conduct their own affairs. It has a one-stop permitting process for most business and industrial activities. Its taxes are lowest in the nation. Its debt is also typically lowest in the US, less than 1% that of New York or California. (<http://www.census.gov/compendia/statab/>). The community has suffered in the past due to an economy overly dependent on one economic sector. Diversification is a high priority and the region is deeply committed to making this happen by recruiting new manufacturing plants and other business activities. This study is one of several proactive steps under way. Based on past success rates, there is a high likelihood that this effort will do well, providing new business opportunities for companies such as turbine manufacturers, as well as new jobs for Wyomingites.



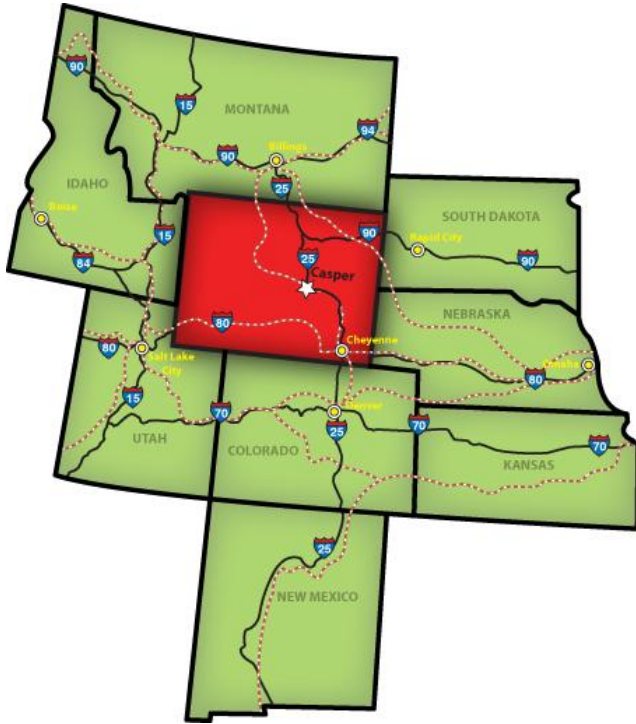
can accommodate wind farms without disrupting other uses such as ranching. A map of Wyoming's wind resources is at right and at (http://www.eere.energy.gov/windandhydro/windpoweringamerica/images/windmaps/wy_50m_800.jpg). Its capacity relative to the US is shown above and at (http://www.eere.energy.gov/windandhydro/windpoweringamerica/wind_maps_none.asp). Commercial wind farms have been operating in Wyoming for over a decade.

4. Market Opportunities in the Surrounding Region. A Casper/Natrona County location offers manufacturers the opportunity to serve expanding turbine markets. The Rocky Mountain/Inland West is one of the most rapidly growing parts of the nation, both demographically and economically. The market for new turbines is enhanced by such growth.

Further, Wyoming has some of the best conditions in the US for wind turbine installations, with dependable wind in many areas and large amounts of land which



5. Transportation, Infrastructure and Business Support Services. Casper-Natrona County has been an important business and industrial center for many decades and has a wide range of services likely to be needed by a turbine manufacturing plant. It is well served for inbound and outbound shipping. The presence of Interstate Highway 25 and a major BNSF Railway line and local yard are an important transportation advantage, reducing cost and time of inbound raw materials shipment. Casper and Natrona County enjoy an abundance of the utilities, energy, and industrial support services likely to be needed by most turbine manufacturing plants. Foreign Trade Zone 157 is located at Casper/ Natrona County International Airport in association with a 200-acre industrial park which provides many opportunities for savings in costs and taxes for companies whose business is international.



Casper and Natrona County enjoy an abundance of the utilities, energy, and industrial support services likely to be needed by most turbine manufacturing plants. Foreign Trade Zone 157 is located at Casper/ Natrona County International Airport in association with a 200-acre industrial park which provides many opportunities for savings in costs and taxes for companies whose business is international.

R&D assistance for turbine manufactures is available from several institutions in and near Casper. Casper College and the University of Wyoming have professional staff with expertise in this field. The US Energy Department operates the National Renewable Energy Laboratory in Golden, Colorado not far south

of Casper and Natrona County. Its National Wind Technology Center is the nation's leading facility for advancing the technology of wind turbines and related equipment (<http://www.nrel.gov/wind/nwtc.html>).





Casper-Natrona County offers turbine manufacturers the potential for a nearly 16% reduction in capital and operating costs, compared with national average or typical costs for such facilities. This section illustrates some of those potentials.

It estimates certain costs for a hypothetical turbine generator production facility in Casper-Natrona County and compares them with national average or typical costs for plants in the turbine manufacturing industry. This hypothetical plant consists of a 100,000-square foot building on a site assumed to be 10 acres. This plant is assumed to employ 50 personnel. Its electrical energy consumption is 10 million kilowatt-hours per year.

Personnel. The national average annual pay for a typical turbine plant is estimated from various public and private sources to be about \$62,000. It is estimated that a similar pool of employees could be hired in Casper-Natrona County for an average of \$52,000. This is based on data from public sources including the US Department of Commerce and discussions with managers of industrial plants in Casper-Natrona County.

On this basis, annual direct wage costs for 50 employees in Casper-Natrona County would be \$2,600,000, while the national average would be \$3,100,000.

Fringe benefits are estimated to cost an additional 35% in both cases. Therefore the total annual personnel cost in the hypothetical Casper-Natrona County production plant would be \$3,510,000 while in the national average plant, it would be \$4,185,000.

On this basis, a **turbine manufacturing plant located in Casper-Natrona County could save its owner \$675,000 per year in personnel-related costs.**

Building. On a national average basis, it would probably cost \$95 per square foot to construct. For a building of 100,000 square feet, the total cost would thus be \$9,500,000.

R.S. Means Construction Cost Data indicates that construction costs in Casper are about 81.5% of the national average. Consequently, a local cost of \$7,742,500 is assumed for constructing the hypothetical plant. **This is a saving in construction costs of over \$1.75 million.**

Land. A recent national average estimate for above-average quality industrial sites was \$34,000 per acre. In Casper-Natrona County, undeveloped land can be low cost but fully serviced sites are in short supply due to rapid recent growth; so comparable sites may cost

as much as \$130,000 per acre. If a 10-acre site is purchased, the national average cost would be \$340,000. In Casper and Natrona County, the price would be \$1.3 million.

Combined Building and Land Costs. Based on the above assumptions, the national average cost for building and land together would total \$9,630,000; while in Casper and Natrona County the comparable cost would be \$9,042,500. So even with high local land costs, the total in Casper and Natrona County would be almost \$800,000 lower.

One way to express this cost in a manner comparable to wages and other ongoing expenses is to spread it across a period of years, in a manner similar to a mortgage. Even if the firm does not literally borrow money from a bank, in effect it pays an opportunity cost for money that could otherwise be invested or used profitably elsewhere.

Based on a 6% interest rate and monthly amortization over 8 years, annual payments for the national-average facility would be \$1,518,622. In Casper-Natrona County, this cost would be \$1,425,975. **This amounts to an annual savings of over \$93,000 in facility costs in Casper-Natrona County compared with the national average.**

Energy Costs. Estimates of electric costs are subject to much variation at this time, since deregulation allows electric energy suppliers to market themselves outside traditional territories and affect other economics of the industry. Even so, Wyoming still enjoys some of the nation's most competitive industrial rates.



The hypothetical plant considered in this study is assumed to have a monthly average electricity consumption of a million kilowatt-hours or 10 million kWh in a year. According to the US Energy Information Administration, the national average cost for electric power sold to industrial users is

\$0.0625/kilowatt-hour. It is thus projected that the nationwide average annual electric power cost for a plant with these requirements might be \$625,000.

It is assumed the turbine manufacturing plant in the Casper area would pay the average Wyoming rate quoted by the EIA of \$0.0408/kilowatt-hour. This is obviously an estimate, which would vary depending upon specific conditions. If it is the case, however, the plant's total annual average electric energy cost would be \$408,000.

Using these figures, **a plant located in Casper-Natrona County would save over \$217,000 per year in electric energy bills.**

The natural gas consumed by this plant is assumed to be purchased from a broker or wholesale supplier, rather than directly from the local gas company. The cost of such "transportation gas" is dependent on the spot price of gas at the wellhead rather than local tariffs, and so its variations are mostly not affected by location. In fact, Wyoming has large gas deposits which may well lead to lower costs for an industrial plant in Casper but no clear figure can be projected.

Summary of Cost Items. The capital and operating costs associated with a turbine manufacturing plant, as discussed on the previous pages, are summarized below:

<u>Cost Item</u>	<u>National Average or Typical Plant</u>	<u>Natrona County Plant</u>
Wages	\$3,100,000	\$2,600,000
Fringe Benefits	1,085,000	910,000
Amortization of Land and Building	1,518,622	1,425,975
Electric Power:	<u>625,000</u>	<u>408,000</u>
TOTAL	<u>\$6,328,622</u>	<u>\$5,343,975</u>
Index (National Average = 100)	100.0	84.4

Thus the total of these selected costs in Casper and Natrona County is nearly 16% below the national average for a comparable facility.

These costs are highly generalized estimates for a hypothetical turbine manufacturing plant. Most base data is derived from figures developed by the US Commerce Department and other governmental agencies, industry organizations, and BFPC's experience with clients in this business.

The overall finding is very compelling. **Casper and Natrona County show great promise as a location for turbine manufacturing plants, based on a wide range of cost and other advantages.**

More data about Casper and Natrona County and the region's advantages for your company are available from the



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