NEBRASKA
PROFIT OPPORTUNITIES FOR MANUFACTURERS OF FABRICATED METAL PRODUCTS

prepared by

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EXECUTIVE SUMMARY

Nebraska's attractive business climate, a productive and well-educated labor force, competitive labor and energy costs, and central location are among the wide range of advantages the state offers fabricated metal product manufacturers. Since the 2000–2003 slow down in U.S. manufacturing, demand for fabricated metal products has grown at an accelerating rate. However, U.S. fabricated metal product manufacturers face rapidly increasing foreign as well as domestic competition. For an industry characterized by many small- and medium-sized production facilities, Nebraska provides substantial advantages in reducing costs, expanding capacity, and otherwise becoming more competitive.

This study has been developed specifically for use by fabricated metal product manufacturers to show how a Nebraska plant location can help them better respond to market conditions and significantly improve their competitive positions. Discussed are the many locational advantages the state offers, including new performance-based tax incentives that further enhance an already high-ranking business climate. To demonstrate quantitatively Nebraska's locational advantages, the study includes an analysis of geographically variable labor and energy costs—two areas important to fabricated metal product manufacturers where Nebraska compares particularly favorably.

The analysis makes cost comparisons among states on the basis of a model manufacturing plant. The model plant assumes employment of 50 production workers and the manufacture of a product representative for the Fabricated Metal Product Manufacturing subsector (NAICS 332). Sixteen states are examined in the analysis. Besides Nebraska, these states include those that currently have large fabricated metal product subsectors as well as other states near Nebraska with which it typically competes for industrial location projects.

In the model plant analysis, estimated labor-related costs include the direct wages paid to production workers and costs associated with workers' compensation insurance, unemployment insurance, social security, and fringe benefits. Compared to the 15 alternative states, Nebraska is found to offer an annual savings of $341,709 in labor-related costs, which is 14.2 percent less than the average labor costs for the other states.

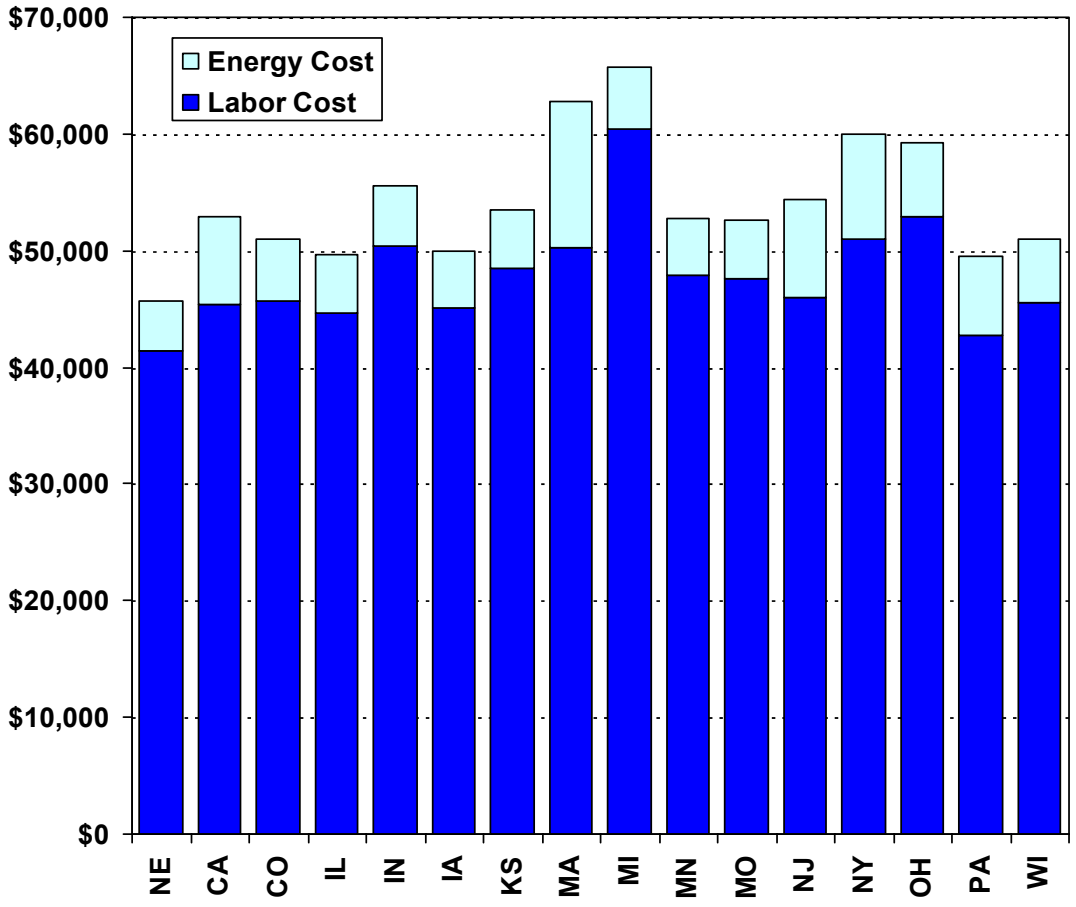
This study also concludes that a Nebraska plant location offers a significant energy cost advantage. Industrial electric rates in the alternative states average 75.5 percent higher, and the average industrial gas rate is 20.3 percent more. Combining these advantages, Nebraska's energy cost for the model plant is 33.9 percent less than the average for the other 15 alternative locations.

Together, Nebraska's annual labor and energy costs for the model plant are $451,000, or 16.5 percent less than the average costs for the 15 alternative states. Conversely, the average labor and energy costs in the other 15 states are 19.7 percent more than the Nebraska labor and energy costs.

Figure 1 provides a summary of the labor and energy costs for the model plant for each of the 16 alternate plant sites. These costs are shown on a per production worker basis.

Figure 1

Labor and Energy Costs per Production Worker for Fabricated Metal Product Manufacturers (NAICS 332)



Calculated labor (wages, workers' compensation insurance, unemployment insurance, social security, and fringe benefits) and energy (electricity and natural gas) costs for a fabricated metal product manufacturer (NAICS 332).

Part A

The Fabricated Metal Product Manufacturing Subsector

The "Fabricated Metal Product Manufacturing" subsector (NAICS 332) is the second largest manufacturing subsector[1], when measured by employment, in the United States. The 2002 Census of Manufacturing indicates the fabricated metal product sector accounted for 10.7 percent of total employment by U.S. manufacturers in 2002. Moreover, fabricated metal product manufacturing establishments represented 17.7 percent of total U.S. manufacturing establishments, accounted for 7.4 percent of value added and 6.3 percent of value of shipments.

As the data shown in Table 1 indicate, the value of shipments for the "Fabricated Metal Product Manufacturing" subsector in the U.S. totaled $288,067.9 million in 2005. Value added in the industry totaled $154,928.0 million, with total employees numbering 1,460,300 and production workers numbering 1,079,200. Capital expenditures for the subsector totaled $7,641.1 million in 2005.

Data for the 1997–2005 review period provided in Table 1 show declines in total "Fabricated Metal Product Manufacturing" subsector employment and the number of production workers from 2000 to 2005. During the same 2000 to 2005 time period, value of shipments, value added, and capital expenditures for the subsector declined until 2003 and then increased in 2004 and 2005. Between 1997 and 2005, the value of subsector shipments grew by 18.6 percent and value added increased by 16.1 percent. During the same period, the number of production workers in

Table 1

The Fabricated Metal Product Manufacturing Subsector (NAICS 332), Characteristics and Trends, Selected Years, 1997–2005

Year	Total Employees (1,000)	Production Workers (1,000)	Value Added (Million $)	Value of Shipments (Million $)	Capital Expenditures (Million $)	Avg. Hourly Earnings Prod. Wrkrs. ($)
1997	1,763.8	1,327.1	133,493.1	242,813.5	9,368.7	13.55
2000	1,814.9	1,375.1	148,874.7	268,212.0	9,991.8	14.54
2001	1,724.7	1,296.0	138,792.7	253,113.4	8,632.9	14.56
2002	1,574.8	1,169.2	138,972.0	247,059.5	7,964.3	15.77
2003	1,487.6	1,110.9	137,451.7	245,339.2	6,661.2	15.81
2004	1,468.5	1,082.0	144,994.8	261,100.5	7,209.4	16.26
2005	1,460.3	1,079.2	154,928.0	288,067.9	7,641.1	16.77

Note: Data for the fabricated metal products subsector as defined by the 1997 definition for NAICS 332, Fabricated Metal Product Manufacturing.

Source: U.S. Bureau of the Census, *Census of Manufacturing, 1997and 2002* and *Annual Survey of Manufactures, 2001 and 2005.*

[1] The North American Industrial Classification System (NAICS)—used by the statisical agencies of the United States, Canada, and Mexico—employs a hierarchical classification structure consisting of: *"National Industries," "NAICS Industries," "Industry Groups," "Subsectors," and "Sectors."* For example, the *"U.S. Industry"* Industrial Valve Manufacturing (NAICS 332911) is part of *"NAICS Industry"* Metal Valve Manufacturing (NAICS 33291), *"NAICS Industry Group"* Other Fabricated Metal Product Manufacturing (NAICS 3329), *"NAICS Subsector"* Fabricated Metal Product Manufacturing (NAICS 332), and *"NAICS Sector"* Manufacturing (NAICS 31-32).

the "Fabricated Metal Product Manufacturing" subsector decreased by 18.7 percent, total employment fell by 17.2 percent, and annual capital expenditures declined by 18.4 percent.

Worker productivity increased significantly during the study review period, with output per production worker increasing 45.9 percent. From 1997 to 2005, the value of shipments of fabricated metal products adjusted for price changes[2] increased 24.5 percent. During the same eight-year period, the average hourly wage for production workers adjusted for price changes[3] increased 1.8 percent.

I. Industry Structure

The *2002 North American Industrial Classification System (NAICS)* divides the "Fabricated Metal Product Manufacturing" subsector (NAICS 332) into nine 4-digit NAICS industry groups shown in Table 2. As a subsequent table will show, these nine 4-digit industry groups are further subdivided into fourteen 5-digit NAICS industries.

The data presented in Table 2 provide a basic description of the "Fabricated Metal Product Manufacturing" subsector with further disaggregation into the major 4-digit NAICS industry groups. The table also provides insights into the relative sizes and growth in industry shipments of the industry groups. For the "Fabricated Metal Product Manufacturing" subsector (NAICS 332) as a whole, industry shipments grew by 16.6 percent between 2002 and 2005. The fastest growing industry group was "Forging and Stamping" (NAICS 3321), with industry shipments growing by 31.8 percent between 2002 and 2005. The value of industry shipments for "Architectural and Structural Metals Manufacturing" (NAICS 3323), the second fastest growing industry group, grew

Table 2

The Fabricated Metal Product Manufacturing Subsector (NAICS 332), Value of Industry Shipments by Industry Group, 2002 and 2005

NAICS	Industry Description	Value of Shipments 2002 (Million $)	Value of Shipments 2005 (Million $)	% Change 2002-2005 (Percent)	% of Total 2005 (Percent)
332	**Fabricated Metal Product Manufacturing**	**247,059,502**	**288,067,852**	**16.6**	**100.0**
3321	Forging and Stamping	21,374,109	28,181,058	31.8	9.8
3322	Cutlery and Handtool Manufacturing	10,721,361	10,680,091	-0.4	3.7
3323	Architectural and Structural Metals Manufacturing	60,045,498	73,556,812	22.5	25.5
3324	Boiler, Tank, and Shipping Container Manufacturing	23,297,854	24,939,832	7.0	8.7
3325	Hardware Manufacturing	10,406,332	10,303,308	-1.0	3.6
3326	Spring and Wire Product Manufacturing	9,034,790	10,086,670	11.6	3.5
3327	Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing	42,840,431	50,561,984	18.0	17.6
3328	Coating, Engraving, Heat Treating, and Allied Activities	18,931,939	22,660,532	19.7	7.9
3329	Other Fabricated Metal Product Manufacturing	50,407,188	57,097,565	13.3	19.8

Source: U.S. Bureau of the Census, *2002 Census of Manufacturing, Industry Series* and *Annual Survey of Manufactures, 2005.*

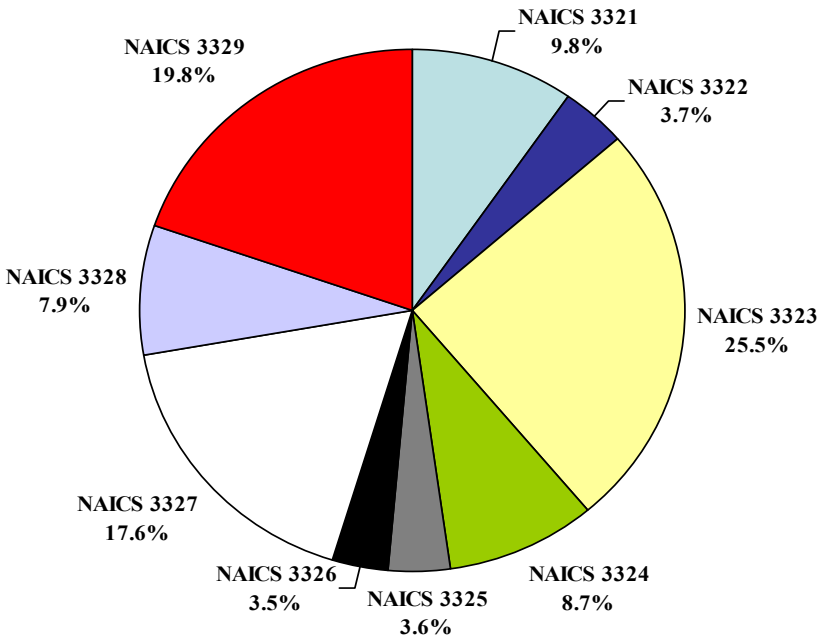
[2] Values adjusted using U.S. Bureau of Labor Statistics, *Producer Price Index for Fabricated Metal Products*.
[3] Values adjusted using U.S. Bureau of Labor Statistics, *Consumer Price Index for All Urban Workers*.

22.5 percent between 2002 and 2005. Other "Fabricated Metal Product Manufacturing" subgroups experiencing relatively faster growth in value of shipments between 2002 and 2005 include "Coating, Engraving, Heat Treating, and Allied Activities" (NAICS 3328), which recorded a 19.7 percent increase, and "Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing" (NAICS 3327), which recorded an 18.0 percent increase.

The data in Table 2 and Figure 2 show the relative importance of fabricated metal product manufacturing subgroups, in terms of value of shipments for each industry group. "Architectural and Structural Metals Manufacturing" (NAICS 3323) is the largest industry group, accounting for 25.5 percent of total industry shipments. "Other Fabricated Metal Product Manufacturing" (NAICS 3329–19.8 percent), is the second largest industry group when measured by value of shipments, followed by "Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing" (NAICS 3327–17.6 percent); "Forging and stamping" (NAICS 3321–9.8 percent); "Boiler, Tank, and Shipping Container Manufacturing" (NAICS 3324–8.7 percent); "Coating, Engraving, Heat Treating, and Allied Activities" (NAICS 3328–7.9 percent); "Cutlery and Hand Tool Manufacturing" (NAICS 3322–3.7 percent); "Hardware

Figure 2

Value of Shipments by Industry Group,
Fabricated Metal Product Manufacturers (NAICS 332), 2005



Total 2005 Shipments - $288,067.9 Million

NAICS 3321 Forging and Stamping

NAICS 3322 Cutlery and Hand Tool Manufacturing

NAICS 3323 Architectural and Structural Metals Manufacturing

NAICS 3324 Boiler, Tank, and Shipping Container Manufacturing

NAICS 3325 Hardware Manufacturing

NAICS 3326 Spring and Wire Product Manufacturing

NAICS 3327 Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing

NAICS 3328 Coating, Engraving, Heat Treating, and Allied Activities

NAICS 3329 Other Fabricated Metal Product Manufacturing

Manufacturing" (NAICS 3325–3.6 percent); and "Spring and Wire Product Manufacturing" (NAICS 3326-3.5 percent).

The data in Table 3 provide further detail for the "industry groups." Data showing the number of companies, number of establishments, employees, production workers, value added, value of shipments, and capital expenditures are shown for the "Fabricated Metal Product Manufacturing" subsector (NAICS 332) as a whole for 2002 and for NAICS 4-digit industry groups and 5-digit NAICS industries that make up the subsector. As noted previously, "Architectural and Structural Metals Manufacturing" (NAICS 3323) is the largest industry group, in terms of industry shipments, and, as shown in Table 3, is also the largest in terms of value added.

The data in Table 3 show that "Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing" (NAICS 3327) is the largest industry group in terms of number of companies, number of establishments, total employees, production workers, and capital investment. Also shown in Table 3, "Machine Shops" (NAICS 33271) is the largest 5-digit, NAICS industry in terms of number of companies, number of establishments, total employees, production workers, value added, and capital investment, while "Ornamental and Architectural Metal Products Manufacturing" (NAICS 33232) is the largest NAICS industry in terms of value of shipments.

Table 3

The Fabricated Metal Product Manufacturing Subsector (NAICS 332), Number of Companies and Establishments, Employment, Value of Shipments, Value Added, and Capital Expenditures by Industry Group and NAICS Industry, 2002[a] and 2005

NAICS Code	Industry Description	Number of Companies[b]	Number of Establishments	All Employees	Production Workers	Value of Shipments	Value Added	Capital Expenditures
						- - - - - (Thousand Dollars) - - - - -		
332	**Fabricated Metal Product Manufacturing**	**58,017**	**62,219**	**1,460,268**	**1,079,245**	**288,067,852**	**154,927,983**	**7,641,077**
3321	Forging and Stamping	2,627	2,885	121,171	92,597	28,181,058	13,118,791	829,491
33211	Forging and Stamping	2,627	2,885	121,171	92,597	28,181,058	13,118,791	829,491
3322	Cutlery and Handtool Manufacturing	1,398	1,536	52,330	37,566	10,680,091	6,234,183	214,893
33221	Cutlery and Handtool Manufacturing	1,398	1,536	52,330	37,566	10,680,091	6,234,183	214,893
3323	Architectural and Structural Metals Manufacturing	12,731	13,642	355,227	252,862	73,556,812	36,072,025	1,592,099
33231	Plate Work and Fabricated Structural Product Manufacturing	5,227	5,566	141,407	99,696	34,757,918	16,597,812	603,674
33232	Ornamental and Architectural Metal Products Manufacturing	7,556	8,076	213,820	153,166	38,798,894	19,474,214	988,426
3324	Boiler, Tank, and Shipping Container Manufacturing	1,321	1,619	81,133	61,240	24,939,832	10,466,513	615,836
33241	Power Boiler and Heat Exchanger Manufacturing	292	330	16,954	11,680	3,713,832	1,678,261	70,673
33242	Metal Tank (Heavy Gauge) Manufacturing	595	666	28,975	21,686	5,469,045	2,933,902	104,527
33243	Metal Can, Box, and Other Metal Container (Light Gauge)	449	623	35,204	27,874	15,756,956	5,854,350	440,636
3325	Hardware Manufacturing	810	902	46,906	34,517	10,303,308	5,654,755	209,604
33251	Hardware Manufacturing	810	902	46,906	34,517	10,303,308	5,654,755	209,604
3326	Spring and Wire Product Manufacturing	1,967	2,147	55,149	42,651	10,086,670	5,069,085	222,396
33261	Spring and Wire Product Manufacturing	1,967	2,147	55,149	42,651	10,086,670	5,069,085	222,396
3327	Machine Shops; Turned Product; and Screw, Nut, and Bolt	25,782	26,247	362,627	273,959	50,561,984	31,623,023	2,181,059
33271	Machine Shops	22,177	22,398	248,737	186,617	31,916,789	20,366,541	1,413,960
33272	Turned Product and Screw, Nut, and Bolt Manufacturing	3,641	3,849	113,890	87,342	18,645,195	11,256,482	767,098
3328	Coating, Engraving, Heat Treating, and Allied Activities	5,790	6,353	126,607	97,262	22,660,532	12,943,322	500,471
33281	Coating, Engraving, Heat Treating, and Allied Activities	5,790	6,353	126,607	97,262	22,660,532	12,943,322	500,471
3329	Other Fabricated Metal Product Manufacturing	6,320	6,888	259,118	186,591	57,097,565	33,746,286	1,275,227
33291	Metal Valve Manufacturing	1,069	1,319	98,828	68,747	24,007,282	13,941,492	495,606
33299	All Other Fabricated Metal Product Manufacturing	5,295	5,569	160,289	117,845	33,090,284	19,804,794	779,621

[a] Number of companies and establishments from the *2002 Census of Manufactures* all other data from the *2005 Annual Survey of Manufactures.*

[b] Company values for "Industry Groups" and "NAICS Industries" do not sum to "Sector" total.

Source: U.S. Bureau of Census, *Census of Manufactures, 2002* and *Annual Survey of Manufactures, 2005.*

II. Industry Production Characteristics

The manufacture of fabricated metal products encompasses a very large and diverse industry. In 2002, 62,219 establishments were primarily engaged in fabricated metal product manufacturing, a decrease of 0.3 percent from 1997 (see Table 4). It is interesting to note that the number of large establishments, as measured by employment, declined while the number of smaller establishments increased during this period. Between 1997 and 2002, establishments in the "Fabricated Metal Product Manufacturing" subsector employing 20 or more workers decreased by 1,824, or 9.6 percent, while those with fewer than 20 employees increased by 1,659, or 3.8 percent.

The data presented in Table 4 compare selected characteristics of the "Fabricated Metal Product Manufacturing" subsector as a whole for 1997, 2002, and 2005. During the 1997–2002 period, total employment in the subsector declined by 10.7 percent; as noted earlier, most of the reduction occurred between 2000 and 2002. During the same 1997–2002 period, the number of production workers in the subsector decreased by 11.9 percent with production workers' hours declining 13.2 percent. For the 1997–2005 period, total employment in the "Fabricated Metal Product Manufacturing" subsector decreased by 303,700 or 17.2 percent and the number of production workers declined from 1,327,100 to 1,079,200, a reduction of 247,900 or 18.7 percent.

As shown in Table 4, between 1997 and 2002 the "Fabricated Metal Product Manufacturing" subsector experienced very small increases or declines in cost of materials (1.8 percent decrease), value added (4.1 percent increase), and value of shipments (1.7 percent increase). During the recent 2002 to 2005 period, the subsector experienced large increases in cost of materials (24.5 percent), value added (11.5 percent), and value of shipments (16.6 percent).

Table 4

Production Characteristics for the Fabricated Metal Product Manufacturing Subsector (NAICS 332), 1997, 2002, and 2005

				Percent Change	
	1997	2002	2005	1997-2002	2002-2005
Establishments					
Number [thousands]	62,384	62,219	N/A	-0.3	N/A
With 20+ Employees [thousands]	19,021	17,197	N/A	-9.6	N/A
All Employees					
Number [thousands]	1,764	1,575	1,460	-10.7	-7.3
Payroll [million $]	56,631.6	57,534.9	59,342.2	1.6	3.1
Production Workers					
Number [thousands]	1,327.1	1,169.2	1,079.2	-11.9	-7.7
Hours [millions]	2,674.9	2,321.7	2,261.8	-13.2	-2.6
Wages [million $]	36,251.8	36,607.7	37,919.0	1.0	3.6
Average Hourly Wage [$]	13.6	15.8	16.8	16.0	6.3
Value Added by Manufacture [million $]	133,493.1	138,972.0	154,928.0	4.1	11.5
Cost of Materials [million $]	110,067.8	108,101.2	134,881.7	-1.8	24.8
Value of Shipments [million $]	242,813.5	247,059.5	288,067.9	1.7	16.6
Cost of Purchased Fuels and Electric Energy					
Electric Energy [million $]	2,504.3	2,514.9	2,951.8	0.4	17.4
Purchased Fuels [million $]	1,187.9	1,238.7	1,808.9	4.3	46.0
Quantity of Purchased Electric Energy [million kWh]	41,510.1	40,747.1	52,942.7	-1.8	29.9

N/A - Not Available

Source: U.S. Bureau of the Census, *Census of Manufacturing, 1997 and 2002, Industry Series,* and *Annual Survey of Manufactures, 2005, Statistics for Industry Groups and Industries.*

Since 2002, the cost of materials has been of growing concern for fabricated metal product manufacturers, due, in part, to increases in steel and aluminum prices. Energy inputs are another important production input that has generally increased in price. While the cost of electricity inputs increased by 17.4 percent from 2002 to 2005, the cost of purchased fuels increased by 46.0 percent.

Table 5 provides data for selected additional production characteristics for fabricated metal product manufacturing for 2002. The industry data presented in Table 5 are for "Fabricated Metal Product Manufacturing" (NAICS 332) as a whole; the "Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing" industry group (NAICS 3327); and the balance of the industry, excluding the "Machine Shops; Turned Products; and Screw, Nut, and Bolt" industry group.

As the data in Table 5 indicate, there were 58,017 companies and 62,219 establishments in the "Fabricated Metal Product Manufacturing" subsector (NAICS 332) in 2002. Establishments in the "Machine Shops; Turned Products; and Screw, Nut, and Bolt Manufacturing" industry group (NAICS 3327) totaled 26,247 in 2002, or 42.2 percent of total sector establishments. Data on the distribution of manufacturing establishments by number of employees demonstrate that the industry consists of a large number of small establishments. In 2002, the average establishment in the "Fabricated Metal Product Manufacturing" subsector employed 18.8 production workers; 45,022 or 73.4 percent of the establishments had less than 20 employees; and only 5.3 percent had more than 100 employees.

Data in Table 5 show that, on average, establishments in the "Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing" industry group are much smaller than those in the balance of the fabricated metal product manufacturing subsector. In 2002, 89.9 percent of "Machine Shops; Turned Product; and Screw,

Table 5

Establishment Characteristics for the Fabricated Metal Product Manufacturing Subsector (NAICS 332); Machine Shops; Turned Product and Screw, Nut, and Bolt Industry Group & Balance of Subsector, 2002

	NAICS 332 Fabricated Metal Product Manufacturing	NAICS 3327 Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing	Balance of Fabricated Metal Product Manufacturing
Number of Companies	58,017	25,782	32,235
Number of Establishments	62,219	26,247	35,972
Est. with 20+ Employees	17,197	4,642	12,555
Est. with 20+ Emp (% of Total)	27.64	17.69	34.90
Est. with 100+ Employees	3,280	506	2,774
Est. with 100+ Emp (% of Total)	0.05	0.02	0.08
Production workers	1,169,237	273,574	895,663
Average Prd. Wrks. Per Estab.	18.8	10.4	24.9
Value Added (Million $)	138,972	28,188	110,784
Per Establishment ($1,000)	2,234	1,074	3,080
Per Production Worker ($1,000)	119	103	124
Value of Shipments	247,060	42,840	204,219
Per Establishment	3,971	1,632	5,677
Per Production Worker	211	157	228

Source: *U.S. Bureau of the Census, Census of Manufactures, 2002.*

Nut, and Bolt Manufacturing" establishments had fewer than 20 employees, only 1.9 percent had more than 100 employees, and the average number of production workers per establishment was 10.4, just slightly more than half, 55 percent, of the subsector average. For the "Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing" industry group, 2002 average value added per establishment, $1.1 million, was 41.1 percent of the subsector average and 2002 value of shipments per establishment, $1.6 million, was 41.1 percent of the subsector average.

III. Industry Location Characteristics

Showing the geographic distribution of the "Fabricated Metal Product Manufacturing" subsector, Table 6 presents data on establishments, employment, wages, value added by manufacture, and value of shipments for 16 selected states. As indicated in the table, the 16 states accounted for 37,600 or 60.4 percent, of the 62,219 establishments that manufactured fabricated metal products in 2002.

Included among these states are Nebraska and neighboring states that typically compete with Nebraska for plant locations and states that have high concentrations of the industry. The 16 states are included in this study as alternative sites for plant locations and are evaluated in Part B of this report using the geographically variable labor and energy costs.

In terms of employment and value added by manufacture, the "Fabricated Metal Product Manufacturing" subsector is largest in California, followed by Ohio and Illinois. As the data presented in Table 6 indicate, the 16 states included in this study accounted for 61.3 percent of the production workers and 62.0 percent of the total value added by the "Fabricated Metal Product Manufacturing" subsector in 2002.

California, with 7,931 establishments and 116,122 production workers, led the nation in fabricated metal product manufacturing in 2002. The industry's value added by manufacture in California of $13,293.9 million accounted for 9.6 percent of the total U.S. value added.

Table 6

Location Characteristics of Establishments in the Fabricated Metal Product Manufacturing Subsector (NAICS 332), 2002

State	Number of Establishments	Number of Est. with 20 Emp. or More	Number of Prod. Wrkrs	Value Added ($1,000)	Value of Shipments ($1,000)	Capital Expend. ($1,000)	Avg. Hourly Earnings ($)
Nebraska	**299**	**70**	**6,567**	**792,081**	**1,382,506**	**22,845**	**13.56**
California	7,931	1,961	116,122	13,293,869	22,549,209	694,911	15.92
Colorado	837	156	10,242	1,229,089	2,261,356	48,616	15.56
Illinois	3,673	1,229	85,168	10,223,472	17,822,184	575,528	16.35
Indiana	1,896	671	47,191	6,250,213	11,097,174	275,513	15.54
Iowa	643	198	16,178	1,874,005	3,352,947	104,763	15.27
Kansas	566	164	9,958	1,049,308	2,010,119	57,826	14.29
Massachusetts	1,613	455	27,898	3,658,928	5,987,599	186,035	17.06
Michigan	3,600	1,089	68,486	7,906,386	13,599,697	480,057	16.01
Minnesota	1,581	450	27,749	3,747,456	6,533,209	217,033	17.09
Missouri	1,169	295	24,007	2,833,611	4,916,344	137,456	16.03
New Jersey	1,634	394	23,998	2,927,972	5,223,398	144,056	15.75
New York	2,740	704	43,809	5,050,922	8,498,221	290,175	16.00
Ohio	4,221	1,307	93,929	11,824,311	22,187,619	788,887	16.41
Pennsylvania	3,228	1,011	68,246	7,884,798	14,127,141	428,029	15.74
Wisconsin	1,969	656	47,219	5,631,624	9,891,693	319,217	16.46
Total Sel. States	37,600	10,810	716,767	86,178,045	151,440,416	4,770,947	16.07
Percent of U.S.	60.4	62.9	61.3	62.0	61.3	59.9	101.9
Total U.S.	62,219	17,197	1,169,237	138,971,958	247,059,502	7,964,345	15.77

Source: U.S. Bureau of the Census, *2002 Census of Manufactures,* Geographic Area Series.

The data in Table 7 show the transportation characteristics for fabricated metal products. As the data in Table 7 indicate, the average shipping distance for fabricated metal products in 2002 was 318 miles, which was 58 percent of the 546 mile average for all industries. Also shown in Table 7, shipping distances tend to be longer for products with higher product values per ton shipped. The longest average shipment distance in Table 7 is 641 miles for hand tools and cutlery which also had the second highest average per-ton shipment value of $11,930. Pipes and tubes have the lowest average per-ton shipment value, $965, and the lowest average shipment distance, 152 miles.

IV. Capital Expenditures and Industry Outlook

Capital investment in the "Fabricated Metal Product Manufacturing" subsector was $7,641.1 million in 2005, which was $274.1 million or 3.4 percent lower than in 2002. As the data in Table 8 demonstrate, the growth in and rate of capital investment varied significantly among industry groups. The "Boiler, Tank, and Shipping Container Manufacturing" industry group (NAICS 3324) recorded the greatest increase (16.6 percent) in capital expenditures between 2002 and 2005, followed by the "Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing" (8.8 percent), and "Forging and Stamping" (8.4 percent) industry groups. In the case of "Cutlery and Hand Tool Manufacturing," capital expenditures decreased by 30.8 percent between 2002 and 2005.

Economic growth of the "Fabricated Metal Product Manufacturing" subsector is dependent on many factors, including the overall performance of the U.S. economy, economic and business conditions internationally, and the competitive position of U.S. fabricated metal product manufacturers relative to their foreign competitors. Over the longer term, the "Fabricated Metal Product Manufacturing" subsector is expected to record slow, positive growth in output accompanied by moderate declines in employment.

Table 7

Shipment Characteristics for the Fabricated Metal Products Manufacturing Subsector (NAICS 332), 2002

	Value (Mil. $)	Tons (1,000s)	Ton-Miles (Mil. Miles)	Value Per Ton	Average Miles
Total Fabricated Metal Products	**234,570**	**116,447**	**41,743**	**2,014**	**318**
Pipes and Tubes	37,247	38,607	11,541	965	152
Pipe and Tube Fittings	22,032	6,146	2,615	3,585	247
Structures and Parts, Except Prefabricated Buildings	54,964	27,407	10,620	2,005	341
Nails, Screws, Bolts, Nuts, Washers, Staples Except in Strips, and Similar Fastening Articles	28,961	8,802	2,855	3,290	315
Hand Tools and Cutlery, Except of Precious Metals	16,297	1,366	1,256	11,930	641
Interchangeable Tools for Hand- or Machine-Tools	15,983	1,025	N/A	15,593	389
Locks, Mountings and Fittings, Racks and Similar Fixtures, and Automatic Door Closers	10,973	1,787	1,305	6,140	535
Containers of a Capacity not Exceeding 300 Litres, Except Containers for Compressed or Liquified Gas	13,174	6,722	1,945	1,960	383
Other	34,939	24,585	9,606	1,421	517

N/A Not available

Source: U.S. Bureau of Census, *2002 Commodity Flow Survey.*

Table 8

Capital Expenditures in the Fabricated Metal Product Manufacturing Subsector (NAICS 332), by Industry Groups, 2002 and 2005

NAICS Code	Industry Description	Capital Expenditures 2002	Capital Expenditures 2005	Percent Change 2002−05	2005 Cap Exp as % Value Added
		- - - - (Thousand Dollars) - - - -			
332	**Fabricated Metal Product Manufacturing**	**7,912,210**	**7,641,077**	**-3.40**	**4.90**
3321	Forging and Stamping	765,002	829,491	8.40	6.30
3322	Cutlery and Hand Tool Manufacturing	310,743	214,893	-30.80	3.40
3323	Architectural and Structural Metals	1,622,936	1,592,099	-1.90	4.40
3324	Boiler, Tank, and Shipping Container Manufacturing	528,331	615,836	16.60	5.90
3325	Hardware Manufacturing	261,161	209,604	-19.70	3.70
3326	Spring and Wire Product Manufacturing	256,182	222,396	-13.20	4.40
3327	Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing	2,004,974	2,181,059	8.80	6.90
3328	Coating, Engraving, Heat Treating, and Allied Activities	688,349	500,471	-27.30	3.90
3329	All Other Fabricated Metal Product Manufacturing	1,474,532	1,275,227	-13.50	3.80

Source: U.S. Bureau of Census, *Census of Manufactures, 2002* and *Annual Survey of Manufactures, 2005.*

As indicated by the data presented in Table 9, employment in the "Fabricated Metal Product Manufacturing" subsector (NAICS 332) is projected to decline by 2.0 percent between 2004 and 2014. During the same period, real output is projected to increase 20.6 percent, which is less than half the projected 42.0 percent increase for the entire manufacturing sector. The "Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing" (NAICS 3327) industry group is projected to experience the greatest growth in employment, 5.3 percent, between 2004 and 2014. The "Machine Shops; Turned Product; Screw, Nut, and Bolt Manufacturing" (NAICS 3327) and "Coating, Engraving, Heat Treating, and Allied Activities" (NAICS 3328) industry groups are projected to experience the largest increases in value of output, 39.9 and 39.4 percent respectively. The "Spring and Wire Product Manufacturing" industry group (NAICS 3326) is projected to experience the slowest growth in real output (decrease of 0.2 percent) and employment (decrease of 2.1 percent) from 2004 and 2014.

On balance, the factors affecting firms producing fabricated metal products will depend to a great extent on the ability of companies to compete within their industry and in the markets for their products. While many external factors will influence the overall performance of the industry, the outlook for individual companies that can control costs and respond to emerging and changing market opportunities will be significantly enhanced. Part B of this study discusses how establishments producing fabricated metal products can better respond to market conditions and significantly improve their competitive positions with a Nebraska location.

Table 9

Employment and Output, Fabricated Metal Product Manufacturing Subsector, by Industry Group, and for All Manufacturing, 1994, 2004, and Projected 2014

		Part A -- Employment				
		Thousands of Jobs			Avg. Ann. Rate of Change	
NAICS	Industry	1994	2004	2014	1994-2004	2004-2014
31-33	Manufacturing	17,346.5	14,649.2	13,876.3	-1.7	-0.5
332	Fabricated Metal Product Manufacturing	1,589.7	1,527.5	1,496.3	-0.4	-0.2
3321	Forging and Stamping	131.4	109.8	100.0	-1.8	-0.9
3322	Cutlery and Hand Tool Manufacturing	79.0	61.4	55.4	-2.5	-1.0
3323	Architectural and Structural Metals Manufacturing	351.4	396.7	405.7	1.2	0.2
3324	Boiler, Tank, and Shipping Container Manufacturing	106.4	92.4	85.1	-1.4	-0.8
3325	Hardware Manufacturing	55.4	38.3	34.8	-3.6	-1.0
3326	Spring and Wire Product Manufacturing	80.6	61.9	50.0	-2.6	-2.1
3327	Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing	326.9	336.7	354.7	0.3	0.5
3328	Coating, Engraving, Heat Treating, and Allied Activities	148.5	146.1	151.0	-0.2	0.3
3329	Other Fabricated Metal Product Manufacturing	310.1	284.2	259.6	-0.9	-0.9

		Part B --Value of Output				
		Billions of Chain-Weighted 2000 Dollars			Avg. Ann. Rate of Change	
NAICS	Industry	1994	2004	2014	1994-2004	2004-2014
31-33	Manufacturing	3,345.4	4,154.7	5,900.8	2.2	3.6
332	Fabricated Metal Product Manufacturing	214.4	253.9	306.2	1.7	1.9
3321	Forging and Stamping	20.7	23.5	25.2	1.3	0.7
3322	Cutlery and Hand Tool Manufacturing	10.8	12.3	14.8	1.3	1.9
3323	Architectural and Structural Metals Manufacturing	45.6	57.4	70.2	2.3	2.0
3324	Boiler, Tank, and Shipping Container Manufacturing	22.0	23.2	23.8	0.5	0.3
3325	Hardware Manufacturing	11.0	10.6	13.3	-0.4	2.3
3326	Spring and Wire Product Manufacturing	7.4	8.2	8.0	1.0	-0.2
3327	Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing	34.7	45.4	63.5	2.7	3.4
3328	Coating, Engraving, Heat Treating, and Allied Activities	15.7	20.3	28.3	2.6	3.4
3329	Other Fabricated Metal Product Manufacturing	46.5	52.9	59.3	1.3	1.1

Source: U.S. Bureau of Labor Statistics, *Office of Occupational Statistics and Employment Projections,* **www.bls.gov/emp/home.htm** Employment and output projections for 2014 (2006).

Part B

Nebraska Advantages for Fabricated Metal Products Manufacturers

Nebraska offers a wide range of locational advantages to fabricated metal product manufacturers. In the continuing portion of this study, Nebraska resources and location attributes important to fabricated metal product manufacturers are discussed. An evaluation of geographically variable labor and energy costs for selected states follows using a model establishment manufacturing fabricated metal products

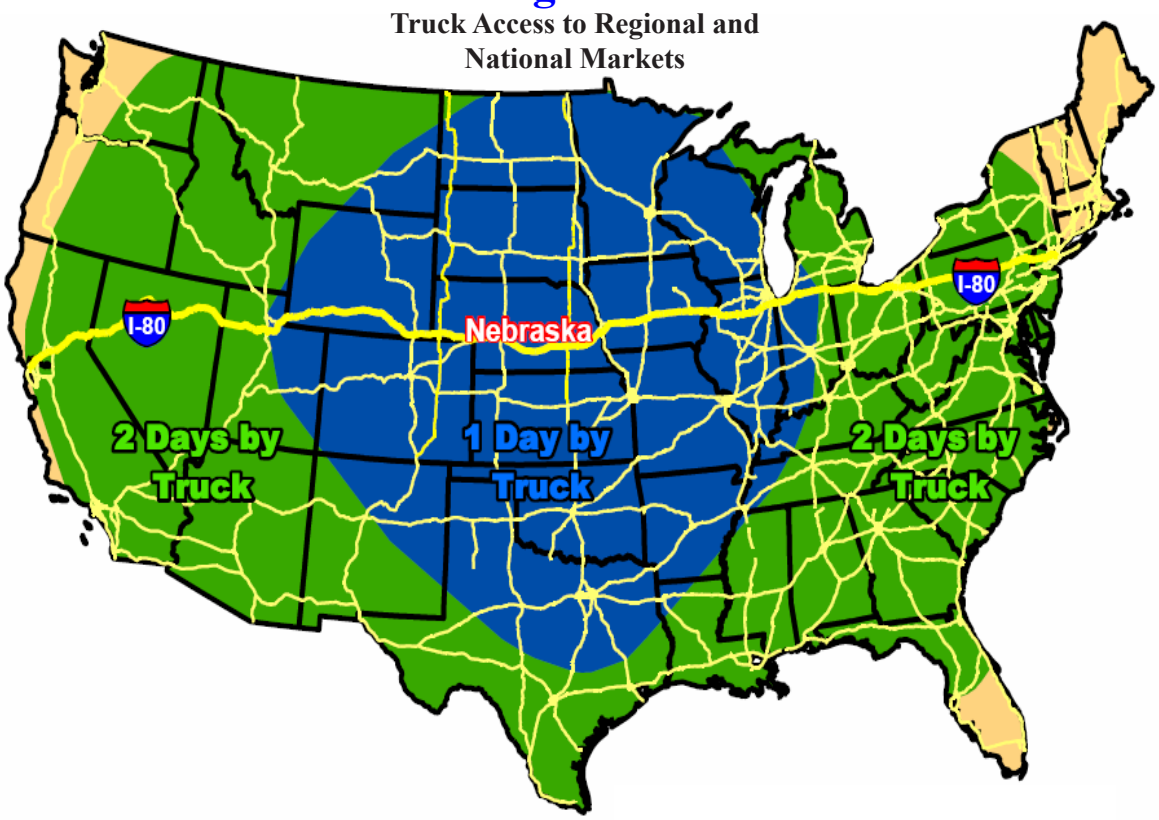
I. Nebraska Location Resources

Nebraska lies near both the population and geographic centers of the United States (Figure 3). The nation's population center moved across the Mississippi River for the first time in 1980 and continues to shift westward. The current population center is in Crawford County, Missouri, and the geographic center is in Butte County, South Dakota (the geographic center of the 48 contiguous states is Smith County, Kansas). Because of this central location, more than 50 million people live within a 500-mile radius of Nebraska.

In addition to being a prominent location for national markets, Nebraska is well situated to serve international markets, which are important to many fabricated metal product manufacturers. For example, the Union Pacific's main railroad line in central Nebraska is the busiest freight corridor in the world; many of the trains carry grain to West Coast ports for shipment around the world. Also, the state currently has operating Foreign Trade Zones in Omaha (Zone No. 19, Grantee/Operator: Dock Board of the City of Omaha/Douglas Civic Center) and in Lincoln

Figure 3

Truck Access to Regional and National Markets



(Zone No. 59, Grantee/Operator: Lincoln Chamber of Commerce Foreign-Trade Zone). Foreign Trade Zones reduce or eliminate duties and excise taxes by allowing "domestic activity involving foreign items to take place as if it were outside of U.S. Customs territory."

Transportation

Nebraska's central location is especially advantageous for transportation services. The state's communities are connected by a good highway system that includes 8,539 miles of interstate, freeway, and arterial roads. That system includes a 482-mile stretch of Interstate Highway 80, the most traveled east-west transcontinental route of the interstate highway system. North-south interstate highways that add to Nebraska's market include Interstate 29, which passes along the state's eastern border in Iowa, and Interstate 25, which passes in close proximity to the state's western border.

Largely because of Nebraska's good interstate connections, one of the largest trucking companies in the country, Werner Enterprises, is headquartered in Omaha. Altogether, a total of 20 Class I and 12 Class II motor freight carriers are headquartered in Nebraska. One-day motor carrier service is available from most Nebraska cities to Chicago, Denver, Kansas City, Minneapolis, and St. Louis.

Two major railroads serve the state—the BNSF Railway Company and the Union Pacific. There are 12 freight railroads operating more than 3,475 miles of track throughout Nebraska. A reciprocal switching agreement is in effect for all railroads. Omaha is one of the nation's major rail centers, serving as the headquarters of the Union Pacific. The most direct mid-continent route to the West Coast passes through Nebraska with branches that terminate in Portland, Spokane, Seattle, and Los Angeles. No major city in the United States is more than five days away by rail from Nebraska.

Commercial airline service is available in nine Nebraska cities, providing direct service to major hubs. Scheduled air freight service is provided to five additional communities with on-demand service available. A total of 83 public-use airports are located throughout the state.

The Missouri River, on Nebraska's eastern border, provides a water link to the Gulf of Mexico and the Atlantic Ocean via the Mississipi River. The U.S. Army Corps of Engineers maintains a 9-foot deep, 300-foot wide channel for 735 navigable miles from Sioux City to the mouth of the Missouri River near St. Louis. The free-flowing river with no locks or dams is navigable approximately eight months of the year.

Utilities

In providing a full range of reliable utilities with many cost advantages, Nebraska offers additional benefits to fabricated metal product manufacturers. Nebraska's industrial electric rates are 41.9 percent less than the U.S. average and are among the lowest of the 48 contiguous states (Figure 4). This benefit is of particular importance to the "Fabricated Metal Product Manufacturing" subsector, with its high level of electricity use relative to total energy consumption. A statewide grid system with regional interconnections assures reliability of service and adequacy of supply.

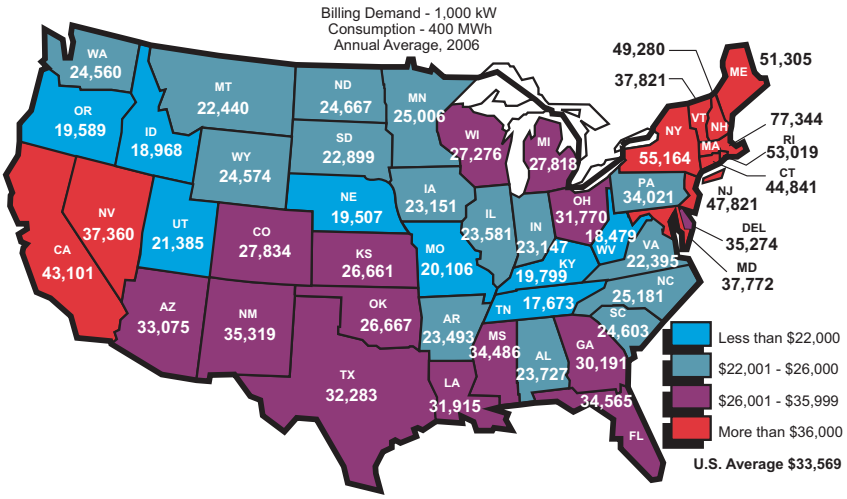
One of the reasons for Nebraska's low electric rates is its close proximity to the vast low-sulfur coal fields of eastern Wyoming. It is also the only state in the nation with electric service provided entirely by public power. Nebraska's two largest electric utilities, Nebraska Public Power District (NPPD) and Omaha Public Power District (OPPD), have under their control an efficient and dependable "mix" of generating systems to supply current and projected needs; the mix includes coal, nuclear, hydro, gas, oil, and diesel sources.

Some major electric-generating facilities in Nebraska are:

- 1,300-megawatt NPPD coal-fired Gerald Gentleman Station near Sutherland, Unit No. 1 on-line in 1979 and Unit No. 2 on-line in 1982
- 575-megawatt OPPD coal-fired Unit No. 1 near Nebraska City, on-line in 1979

Figure 4

Electric Costs for Industrial Service, 2006



Source:Nebraska Public Power District and Edison Electric Institute, *"Typical Bills and Average Rates Report,"* January 1, 2006 and July 1, 2006. State averages are weighted using eight months of January 2006 data and four months of July 2006 data. Nebraska data represent the average for Omaha Public Power District, Lincoln Electric System, and Nebraska Public Power District using the same seasonal weighting.

- 800-megawatt NPPD Cooper Nuclear Station near Brownville, on-line in 1974
- 486-megawatt OPPD Fort Calhoun Nuclear Station, on-line in 1973

Nebraska utilities also operate 12 hydroelectric plants and receive a power allotment from the Western Area Power Administration (WAPA) hydroelectric facilities on the Missouri River. The utilities operate with a reserve capacity that protects users against voltage reductions and brownouts. Furthermore, the utilities are members of the Mid-Continent Area Power Pool (MAPP), which interconnects eight upper Midwestern states and a Canadian province with an extensive network of high voltage transmission facilities.

Natural gas in Nebraska is also attractive to industry for service, supply, and price. A gas-producing state, Nebraska is close and well-connected by pipeline to the major gas fields of the central and southern plains. The state's average cost of industrial gas is less than both the regional and national averages.

The pipelines of two major companies, Northern Natural Gas and SourceGas (formerly Kinder Morgan), provide an ample supply of natural gas to most areas of Nebraska. Depending on usage requirements, natural gas is offered both on a "firm" and "interruptible" basis.

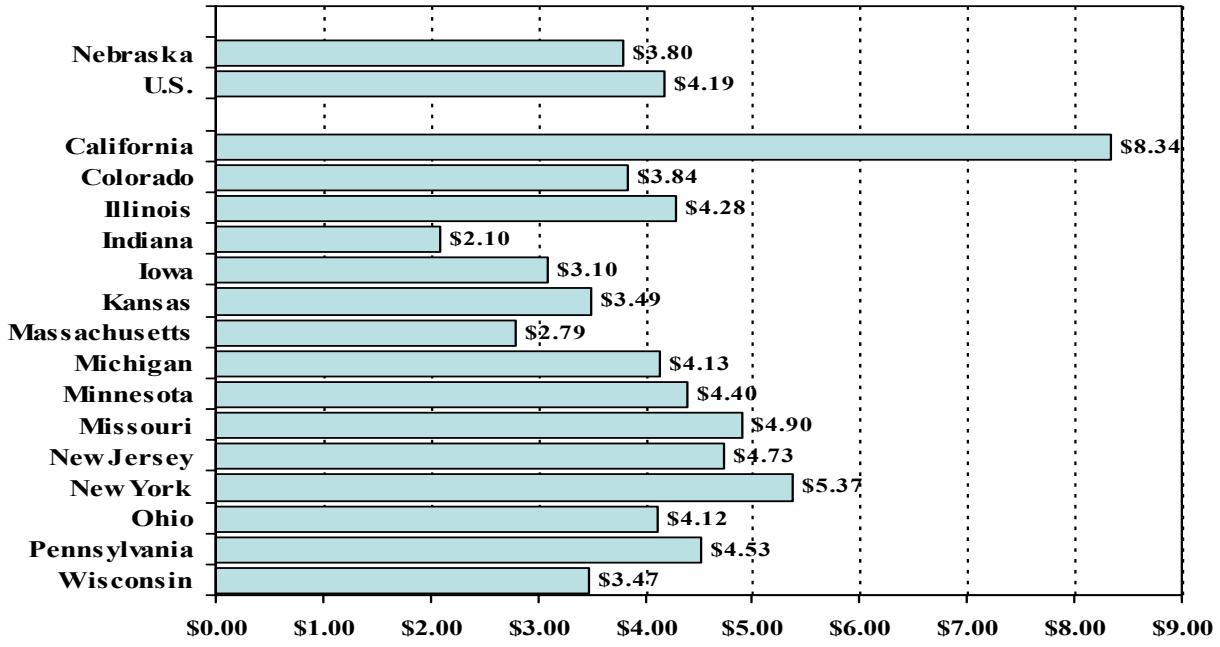
Aquila, a division of Utilicorp United, is the largest retail supplier of natural gas in Nebraska. Aquila is a full-service natural gas distribution company in Nebraska. Natural gas, with an average value of 1,000 BTU, is available for residential, commercial, and industrial customers for base and peak use on a firm basis. Interruptible service is available for customers with an alternate fuel capability.

Labor Quality

Any industry derives benefits from a productive and well-educated labor force. Nebraska's labor force has a strong work ethic and technical proficiency. The state was settled by individuals with the foresight and diligence to transform it into a world center of agricultural production. Their descendants maintain a work ethic and mechanical aptitude that carry over into the state's manufacturing sector. Contributing to Nebraska's high labor productivity are very low absenteeism and labor turnover rates. Furthermore, Nebraska employers pay among the lowest unemployment insurance and workers' compensation costs in the nation.

Figure 5A

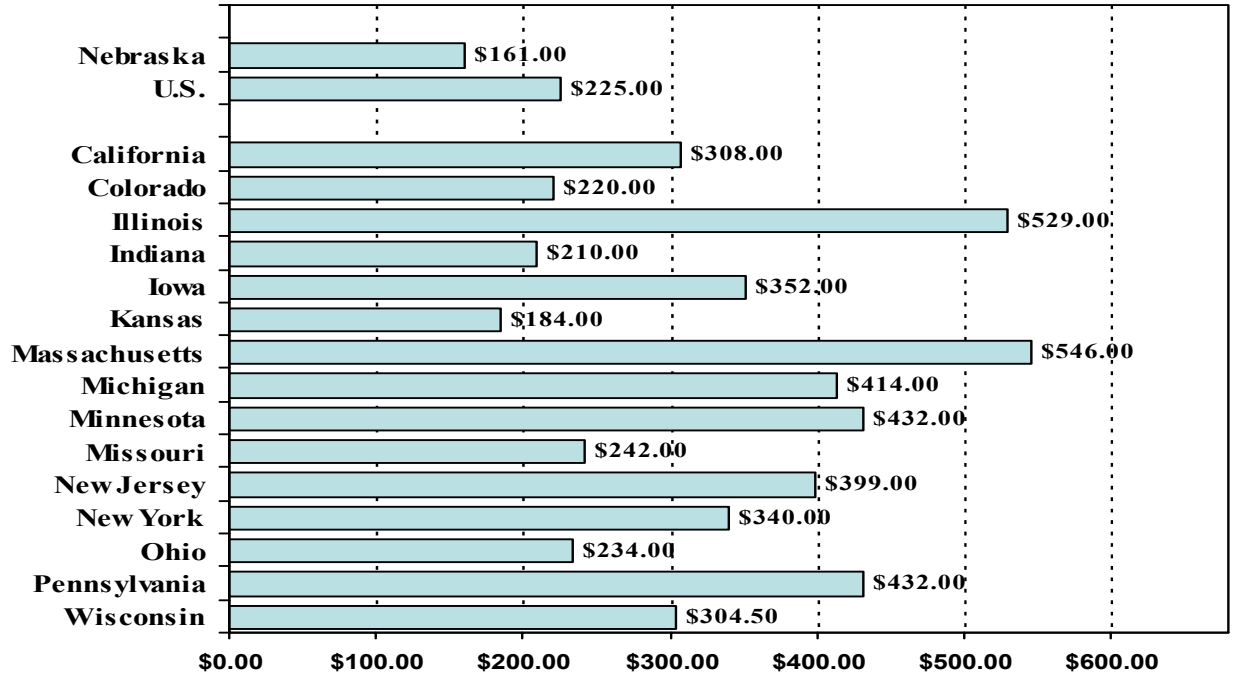
Workers' Compensation Rates, Alternative Plant Locations



Source: See Table 15

Figure 5B

Per Worker Unemployment Insurance Costs, Alternative Plant Locations



Source: See Table 15

In the case of workers' compensation rates, Nebraska's rate of $3.80 per $100 of manufacturing payroll is 10.4 percent lower than the average for the other 15 alternative plant location states included in this study (Figure 5A and Table 15). Nebraska's unemployment insurance rates provide a more significant cost advantage. The state's estimated unemployment insurance cost of $225.00 per worker is 34.4 percent less than the $343.10 average cost for the other states included in the comparison (Figure 5B).

Nebraska's work force quality is also highly rated by the state's employers and by various national comparisons. In 2004, 91.4 percent of the state's population 25 years of age and older were high school graduates, compared to 86.5 percent nationally. In addition, the 2004–05 Nebraska high school graduation rate was 88.0 percent, raking among the highest in the nation. One reason for the high graduation rate is the state's comparatively low student-teacher ratio—13.6:1 in 2004 compared to 15.9:1 for the nation. Finally, Nebraska students consistently score above the U.S. average on both standardized achievement tests and college entrance exams. In 2005 Nebraska students averaged 21.8 on the ACT college entrance test, compared to 20.9 nationally. Moreover, Nebraska's average composite ACT score was achieved with 76 percent of graduates taking the exam, compared to 40 percent of graduates nationwide.

Higher Education Resources and Research

As part of a growing and rapidly changing industry, fabricated metal product manufacturers can benefit greatly from flexible state-of-the-art educational resources. The University of Nebraska, state colleges, and the community college network are important elements in providing resources to assist manufactures in maintaining an educated and trained work force.

The University of Nebraska System (NU) with campuses in Lincoln, Omaha, and Kearney, has the largest facilities among the state's 21 colleges and universities and offers advanced degrees in most professional fields. It is a major center for both basic and applied research and has a combined student enrollment of more than 45,000.

The Lincoln campus of the University of Nebraska, founded in 1869, is the state's land grant university. The University of Nebraska is one of a select group of research universities that holds membership in the Association of American Universities—a distinction granted in 1909. Nebraska was the first university west of the Mississippi to establish a graduate college (in 1896); today, NU is one of the top 50 American universities in the number of doctoral degrees granted annually. The University of Nebraska boasts 22 Rhodes scholars and 3 Nobel laureates among its alumni.

Areas of engineering research and teaching programs at the University of Nebraska include Architectural Engineering, Engineering Mechanics, Chemical and Biomolecular Engineering, Mechanical Engineering, Computer and Electronics Engineering, Computer Science and Engineering, Biological Systems Engineering, Civil Engineering, Construction Engineering, Construction Management, Construction Systems, Electrical Engineering, Industrial and Management Systems, and Agricultural Engineering.

In addition to the teaching departments within engineering, a variety of research centers have been established. Among these are the Nebraska Center for Materials and Nanoscience, Center for Non-Traditional Manufacturing Research, Center for Microelectronics and Optical Materials Research, Center for Laser Analytical Studies of Trace Gas Dynamics, Center for Electro-Optics, Center for Communication and Information Science, Center for Ergonomics and Safety Research, Mid-American Transportation Center, Midwest Roadside Safety Facility, National Bridge Research Organization, and the Engineering and Science Research Support Facility. Following is a brief description of centers offering special expertise of interest to manufacturers of fabricated metal products.

<u>Engineering and Science Research Support Facility (ESRSF)</u>. ESRSF provides manufacturers consulting services, prototyping, new part production runs, and other machining

and construction services. Some of ESRSF's consulting services include: Workflow Management, Product/Process Design, Employee Technical Training, Machining Procedures, and Project Lifecycle Management.

ESRSF is a dedicated, highly diverse technical facility that provides services in:

CNC & Conventional Machining, Welding, Fabrication, and Electroplating/Anodizing
Foundry and Pattern Shop
Computer Aided Design (CAD)
Computer Aided Manufacturing (CAM)
Materials Testing Equipment

Equipment within the facility's machine shop include:

CNC Cincinnati-Milacron 1250 Sabre with Ab Acramatic 2100 Control
- has four-axis operation with a maximum of three-axis interpolation. This machine is used to machine a variety of drill system parts and components. Its large capacity allows for work pieces up to 50" x 30" x 26." This CNC machining center utilizes the latest computer technology for the machining of complex contours through parametric programming (equational programming), solid modeling programming through CAM software, and online quick programming of simple geometries. This feature enhances the technical staff's ability to accommodate a wide range of machining jobs.

BridgePort Series 1 CNC Milling Machines (2)
- provide additional resources for high volume machining and drastically cut delivery time to the customer. They are capable of machining smaller complex and simple 2-dimensional workpieces. Their conversional shop floor programming features allow tool makers to quickly program and machine the work piece.

CNC BridgePort Interact 412 Machining Center
- a three-axis, 12-tool station with a GE Fanuc Series O-Mate control that is available for multiple part production. Off-line part programming using a CAD workstation facilitates part design and production.

CNC Mazak Quick Turn ATC Lathe
- has a unique feature of live tooling on the turret. This feature allows the technical staff to perform turning and milling operations in one setup. The result is a high precision machining process that can be performed without ever having to remove the work piece from the chuck, which eliminates costly secondary machining processes. The Mazak CNC Lathe has been used to machine drill system components for the past eight years.

Engis Lapping Machine
- for precision machining, is used to machine and polish work pieces of extreme tolerances (.000001 inch). Common applications are thin film polishing and material removal, sharpening to razor edges and finishing machining of hardened materials. This lapping machine is located in the clean room facility of the engineering machine shop. During and after machining, the work piece is inspected with precision inspection equipment.

25" x 18" Nardini Gap Bed Lathe
- where much of the large cumbersome work pieces that require turning operations are performed. Drill system equipment such as barrels, large pulleys, housings, winch hubs, etc. currently are machined on the Nardini Lathe. Other heavy applications include the machining of train axles and wheels for material science research projects.

Conventional BridgePort Milling Machines (3)
- used for such applications as milling, drilling, boring, key way cutting, etc.

Conventional 15" x 50" Clausing Lathes (2)
- used for turning, threading, and boring of cylindrical work pieces. All of the conventional machining equipment contains state-of-the-art digital read outs and tooling.

Kent Automatic Surface Grinder
- used for grinding flat and angular surfaces. This grinder has been used for sharpening ice coring cutters, core dogs, reamers, and surface grinding precision drill system parts. An Oliver tool cutter grinder is used for the complex geometry grinding on double angle cutters, core dogs, and reamers.

Tig, Mig, Gas, and Arc Welders
- all have a capacity ranging from very intricate applications to heavy-duty. The Tig and Mig welders can accommodate a wide range of steel and non-ferrous alloys. The shop has an acetylene/oxygen gas torch for brazing and flame cutting, along with a Plasma cutting unit.

Foundry and Pattern Shop
- one of the unique features of the ESRSF. The foundry can produce brass and aluminum sand castings. The crucible capacity is approximately 125 pounds for brass and 20–25 pounds for aluminum. The pattern shop and foundry add versatility to the engineering shop services by furnishing high quality casings. In the past, the foundry was utilized by the Polar Ice Coring Office Engineers for the production of winch hub and bearing housing castings. The patterns for these winch parts are still in the inventory of ESRSF.

Betenbender Heavy Duty Shear, Edwards 100 Ton Iron Worker, and Additional Hand Brakes and Foot Shears
- turn in-house fabrication and sheet metal work into routine services for the machine shop.

Materials Testing Bay
- houses computer controlled testing machines that can perform a variety of material and structural tests. The capacities of these testing machines are from 0 to 440,000 pounds. A torsion testing machine is available for testing barrels, well screens, drive shafts, gears, and more. Impact testing equipment is also accessible for impact tests on metals, plastic, and other materials.

Nebraska Center for Materials and Nanoscience (NCMN) is a multidisciplinary organization with about seventy faculty members in eight departments in the Colleges of Arts and Sciences, Engineering, and Technology. The Center is concerned with atomic manipulation, properties affected by nanoscale dimensions, self-assembly, ordered nanoarrays, quantum dots and wires, nanoelectronics, quantum computing, nanomechanics, nanooptics, molecular design, nanoelectromechanical systems, nanobiological function, and life sciences.

There are seven central facilities to support the NCMN's mission: Crystallography, Electron Microscopy, Materials Preparation, Metallurgical and Mechanical Characterization, Scanning Probe Microscopy, X-Ray Materials Characterization, and Cryogenics. These facilities are available to NU faculty as well as companies in Nebraska and elsewhere.

Center for Nontraditional Manufacturing Research
This Center is the only research facility in the United States dedicated solely to the examination of nontraditional manufacturing methods. Projects involve both basic and applied research on numerous nontraditional manufacturing processes. The Center focuses on research in the areas of electrical discharge machining, electrochemical machining, abrasive flow machining, and other unique manufacturers' processes. Modern technology has created a new era of advanced materials including composites, engineering ceramics, and super alloys that are stronger, lighter, and in many cases, harder than manufacturer's current cutting tools. This has led to the development of nontraditional processes that use thermal energy, mechanical abrasion, or chemical reactions to machine work pieces. Some of these processes include electrical discharge machining, electrochemical machining, abrasive flow machining, laser machining, and abrasive water jet machining.

Center for Ergonomics and Safety Research
Newly created within the Industrial and Management Systems Engineering Department, the Center for Ergonomics and Safety Research conducts studies in the areas of cumulative trauma disorders, work place design, tool design, and cognitive engineering. Research results from this center can be of great value to new and existing manufacturers.

Along with research and development efforts at the University of Nebraska. Nebraska operates a state college system with campuses at Chadron, Peru, and Wayne. Undergraduate degrees are offered

Figure 6A

Location of Colleges and Universities in Nebraska

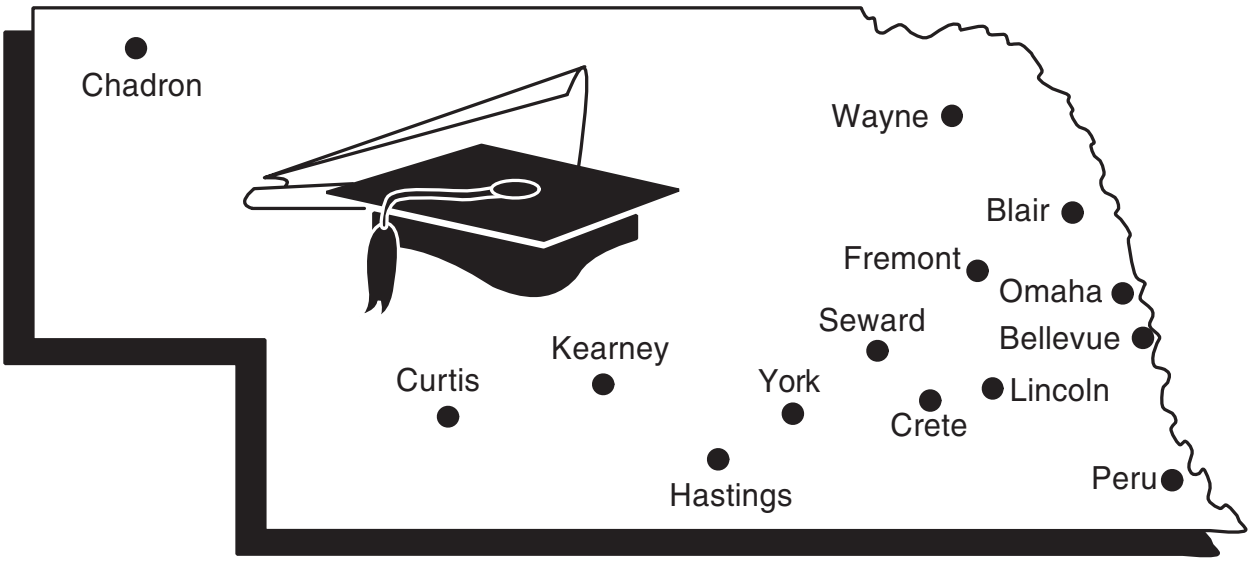
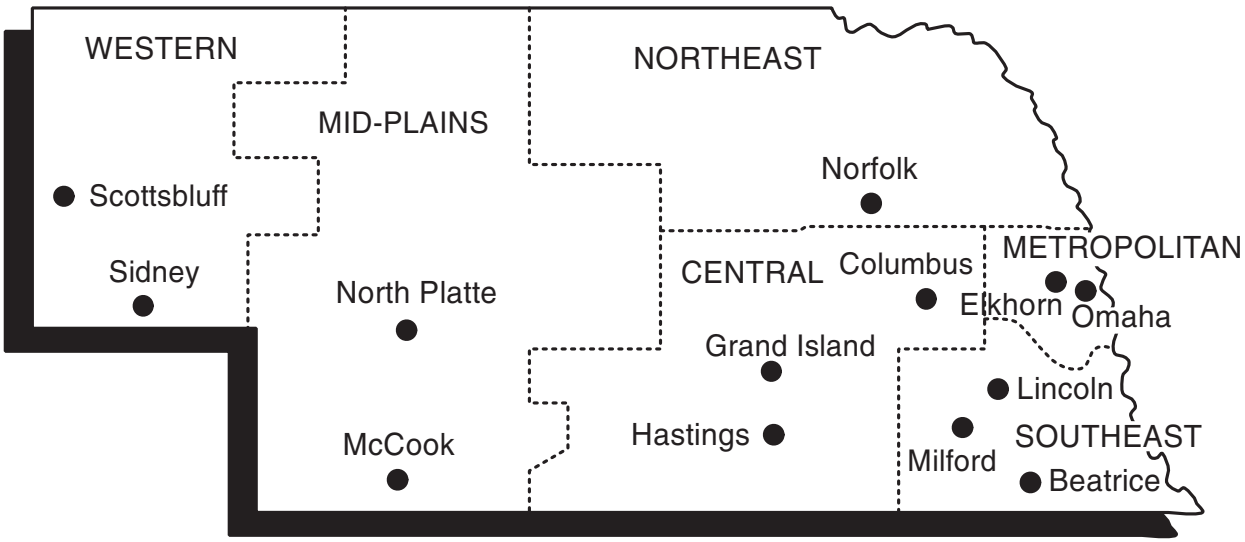


Figure 6B

Community Colleges in Nebraska



Community College Areas
Community Colleges

at these institutions in industrial technology and industrial management and teaching endorsements are offered in Industrial Technology Education and Trade and Industrial Education. A variety of private colleges and universities are also located in Nebraska including Creighton University in Omaha, Nebraska Wesleyan University in Lincoln, and others located throughout the state (see Figure 6A).

Another important facet of higher education in Nebraska is the statewide community college system that provides specialized training programs for new and expanding Nebraska industries. As indicated in Figure 6B, the state has 6 community college areas, which operate campuses in 13 cities across the state. The colleges offer a full curricula of occupational courses, which provide a steady flow of skilled graduates to Nebraska industries. As examples, Hastings and Milford Community College campuses offer vocational/technical training in more than 50 different one- and two-year programs including Associate of Applied Science degrees in "Machine Tool Technology," "Manufacturing Engineering Technology," "Nondestructive Testing Technology," and "Welding Technology." Training is accomplished through the extensive use of hands-on activities and is centered around practical application of technical knowledge gained in lecture and laboratory sessions.

Other Development Assistance Programs

Building on traditional advantages, Nebraska offers additional development assistance programs. Among those programs are the following:

Customized Job Training Program

The Customized Job Training program provides training assistance to eligible companies and training projects with the potential to increase economic development in Nebraska. Examples of companies that qualify are those engaged in selling goods and services primarily to non-Nebraska markets; manufacturing, processing and warehousing operations; and headquarter facilities. Custom job training is a component of the Nebraska Advantage Package, adding $15 million to customized job training.

Industrial Revenue Bonds

All Nebraska counties and municipalities, as well as the Nebraska Development Finance Fund, are authorized to issue industrial revenue bonds to finance land, buildings, and equipment for industrial projects. No general election is required for an issue.

Other Financing Assistance

Supplementing traditional sources, financing assistance is also available through the Nebraska Investment Finance Authority, the Business Development Corporation of Nebraska, and the local development corporations. The Nebraska Department of Economic Development also administers development finance services, with staff helping assemble government financing with conventional financing to put together the best comprehensive package.

Performance-Based Tax Incentives

The Nebraska Advantage package was enacted by the Nebraska legislature in 2005. The Nebraska Advantage package was designed to replace and improve on Nebraska's existing tax incentive programs and to create a business climate that makes Nebraska the preferred location for business start-ups and expansions. The Nebraska Advantage rewards businesses investing in the state and hiring Nebraskans. In this progressive, pro-business tax climate, corporate income and sales taxes are reduced or virtually eliminated. Further information about the Nebraska Advantage is summarized below and is available at **www.NebraskaAdvantage.biz**.

The legislative components of the Nebraska Advantage package include:

Nebraska Advantage Act (LB312)

- Expanded incentives for five "tiers" of investment and/or job creation
- Small business advantage
- Research and development advantage
- Microenterprise tax credit advantage
- Rural development advantage
- State and local sales tax exemptions of manufacturing machinery, equipment, and related services

Qualified businesses for Tier One include research and development, manufacturing, and targeted export services (75% of sales outside Nebraska or to the U.S. Government). Qualified businesses for Tiers Two, Three, Four, and Five include the above plus data processing, telecommunications, insurance, financial services, distribution, storage, transportation, and headquarters (administrative).

Nebraska Agricultural Innovation Advantage (LB90)

- Agriculture opportunities and value-added partnership act
- Building entrepreneurial communities act
- Ethanol production incentive cash fund enhancement

Other components in the Nebraska Advantage package are:

Nebraska Customized Job Training Advantage
Provides a flexible and discretionary job training program that will provide $15 million in customized job training assistance designated for 2006 and 2007. Companies can design their own training or a statewide training team can assist with training needs assessments, training plans, curriculum development, and training instruction.

Nebraska Research and Development Advantage
Offers a tax credit for research and development activities undertaken by any business entity. The credit is equal to 3 percent of research and development expenditures that are greater than the average of the previous two years research and development spending. An important feature—businesses with little or no income may take advantage of the tax credit by receiving a sales tax refund or a refundable income tax credit.

Nebraska Microenterprise Tax Credit Advantage
Provides a 20 percent refundable investment tax credit to micro businesses on new investment in targeted communities. Applicants may qualify for a maximum $10,000 throughout the life of the program. The credit is geared to companies with five or fewer employees, including start-ups. Credits are approved through an application process with the Nebraska Department of Revenue and evaluated on expected local economic impact. The credits would apply to new expenditures for wages, buildings, and non-vehicle depreciable personal property.

Additional Tax Savings:

- Nebraska State and Local Sales Tax Exemptions of Manufacturing Machinery, Equipment, and Related Services
- Inventory Tax Exemptions

It is important to recognize the Nebraska Advantage package replaces and significantly enhances Nebraska's existing performance based tax incentive programs. The existing tax incentives, the first of which was passed by the Nebraska legislature in 1987, have had a profound effect in stimulating business investment, expansion, and job creation. Nebraska's existing tax incentive programs have contributed to substantial investment and job creation, including total investment of $22,139.4 million and 115,858 jobs.

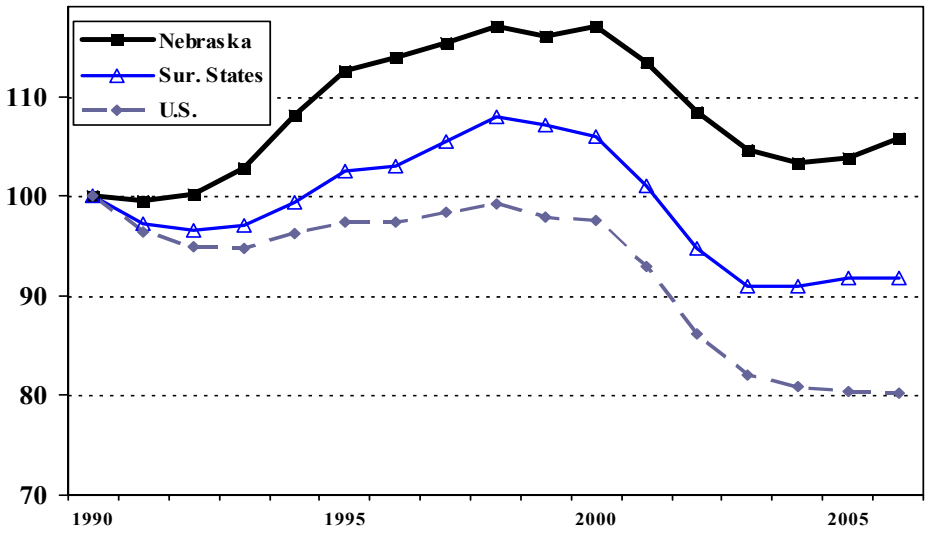
One additional incentive program of note is Community Improvement Financing (CIF), which is Nebraska's version of Tax Increment Financing (TIF). TIF is a method of financing the public improvements associated with a private development project in a blighted area by using the projected increase in property tax revenue that will result from the private development.

In a tax policy incentive, Nebraska determines the taxable income attributable to Nebraska operations using a single factor, or "sales only," formula. This method for determining corporate income tax allocation provides a significant advantage to multi-state unitary firms that sell products or services outside Nebraska. Nebraska also provides a capital gains exemption. State residents may elect, on a one-time basis, to subtract from their income tax liability the gain from the sale of capital stock of a corporation acquired during Nebraska-based employment with that corporation.

The combination of many factors, including Nebraska's attractive business climate, tax incentives, labor productivity, and effective

Figure 7

Manufacturing Employment, Nebraska, Surrounding States, and the U.S., 1990–2006, 1990=100



Surrounding states include data for states contiguous to Nebraska, as a group, including Colorado, Iowa, Kansas, Missouri, South Dakota, and Wyoming.

Source: Bureau of Labor Statistics (**www.bls.gov**).

job training programs as well as other positive attributes, has resulted in Nebraska's manufacturing sector significantly outperforming both that of the surrounding states and of the U.S. as a whole. Manufacturing employment in Nebraska grew by 17.0 percent between 1990 and 2000, declined slightly during the 2000–04 period, and resumed its growth between 2004 and 2006. For the 1990–2006 period as a whole, Nebraska manufacturing employment increased by 5.8 percent, compared with a decline in manufacturing employment for the U.S. as a whole of 19.8 percent (See Figure 7). For Nebraska's neighboring states a group (Colorado, Iowa, Kansas, Missouri, South Dakota, and Wyoming), manufacturing employment declined by 8.2 percent for the 1990–2006 period. These data suggest that companies with Nebraska manufacturing plants benefit from the locational and other competitive advantages associated with doing business in Nebraska.

Quality of Life

For a potential newcomer to Nebraska, the state's livability is obviously also a consideration. Nebraska ranks high in quality of life studies—and below average in cost of living measures. The state's landscape is clean and spacious, both in urban and rural areas. Residents blend Midwestern values with Western enthusiasm for growth and change. This helps create a high degree of citizen participation in both neighborhood and communitywide activities.

The cost of living in Nebraska is consistently below the national average. Data presented in Table 10 indicate on average, the cost of living in Nebraska is 2.6 percent less than the U.S. average. Of particular interest is the cost of housing, which, in Nebraska, averages 6.4 percent less than for the U.S. as a whole for families renting a home.

II. Labor and Energy Cost Analysis

As shown in the previous discussion, Nebraska offers a wide range of locational advantages for fabricated metal product manufacturers. In this section of the study, labor and energy production cost factors that have geographic variability are analyzed. Such analysis permits the identification of the plant site providing the best advantage on these important input factors.

Table 10

Cost of Living in Nebraska, Compared to the National Average, First Quarter, 2007

	All Items Index [a]	Consum-ables	Transpor-tation [b]	Health Services	Monthly Rent [c]	Home Value [c]	Utilities/ Insurance	Income/ Payroll Taxes
U.S. Average	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Nebraska	97.4	88.7	100.2	92.8	93.6	94.7	90.5	99.6
Omaha, NE	102.5	86.0	102.8	92.9	120.7	112.2	89.6	95.8
Lincoln, NE	104.1	90.9	100.2	93.9	108.4	113.6	93.5	95.9
Nonmetro NE [d]	91.8	85.9	100.2	91.4	75.1	80.1	88.4	102.5

[a] Cost of living values computed for a family of three with an annual income of $50,000.

[b] Transportation costs assume ownership of two cars valued at $14,312 which are driven a total of 20,000 miles annually.

[c] Assumes a house of 1,613 square feet for both rental assumption and home value.

[d] Nonmetro Nebraska data represent the average of 14 Nebraska cities outside of the Omaha and Lincoln metropolitan areas. These cities include Beatrice, Columbus, Dakota City, Fremont, Grand Island, Hastings, Kearney, McCook, Norfolk, North Platte, O'Neill, Scottsbluff, South Sioux City, and Valentine.

Source: Index values computed from cost-of-living data obtained from Economic Research Institute (ERI), Relocation Assessor Database for the first quarter of 2007.

In the analysis of geographically variable labor and energy costs, the following procedures are used:

1) Selection of alternative plant locations for evaluation of the geographically variable labor and energy costs.
2) Definition of a model manufacturing plant for identifying labor and energy inputs and costs.
3) Evaluation of labor-related costs associated with each alternative plant location.
4) Evaluation of energy costs for each alternative plant location.

Alternative Plant Locations

Sixteen alternative plant locations were selected for comparison in this analysis. The plant locations essentially were in two groups of states: 1) states that currently have large numbers of fabricated metal product manufacturers, and 2) neighboring and nearby states to Nebraska that typically compete for industrial location projects. The first group of states includes California, Colorado, Illinois, Indiana, Massachusetts, Michigan, New Jersey, New York, Ohio, and Pennsylvania. The second group of states include Nebraska, Iowa, Kansas, Minnesota, Missouri, and

Table 11

Alternative Locations for a Model Plant for the Fabricated Metal Product Manufacturing Subsector (NAICS 332)

State	Percent of Value Added by Manufacture [a]
Nebraska	**0.6**
California	9.6
Colorado	0.9
Illinois	7.4
Indiana	4.5
Iowa	1.3
Kansas	0.8
Massachusetts	2.6
Michigan	5.7
Minnesota	2.7
Missouri	2.0
New Jersey	2.1
New York	3.6
Ohio	8.5
Pennsylvania	5.7
Wisconsin	4.1
Total selected states	**62.0**

[a] Percent of the 2002 U.S. total value added by manufacture for establishments in NAICS 332.

Source: U.S. Bureau of the Census, *2002 Census of Manufactures,* Geographic Area Series.

Table 12

Characteristics of a Model Plant for the Fabricated Metal Product Manufacturing Subsector (NAICS 332)

	Total Model Plant	Per Production Worker
Production Workers	50	- - -
Value Added [dollars] [(a)]	7,177,910	143,558
Total Output [dollars] [(b)]	13,346,363	266,927
Energy Inputs [million BTUs] [(c)]	19,831	396,626

[(a)] Estimated value added applies the 2005 value added per production worker for the Fabricated Metal Product Industry to the model plant (see Tables 3 & 4.).

[(b)] Estimated value of shipments derived by applying the 2005 value of shipments per production worker to the model plant (see Tables 3 & 4).

[(c)] Estimated by applying the 2002 ratio of energy inputs per production worker to the model plant (see Table 13).

Source: Calculated from data presented in Tables 3 and 13.

Wisconsin. Combined, these two groups of states account for 62.0 percent of the value added by manufacturer in the fabricated metal product manufactures industry (see Table 11).

The Model Plant

To facilitate the analysis of the comparative labor and energy costs for the alternative states, it is useful to define a model plant for which the geographically variable costs can be quantified. The model plant is assumed to manufacture a product representative of the fabricated metal product manufactures industry as a whole. To specify the relevant labor and energy costs, information was obtained from the *2002 Census of Manufactures*, and the *2005 Annual Survey of Manufactures*.

Table 12 presents industry characteristics used in developing the model plant, which is assumed to employ 50 production workers. Estimated production worker hours total 100,000 annually or 2,000 hours per worker. Value added by

Table 13

Energy Use in Fabricated Metal Product Manufacturing Establishments

Part A

Estimated 2005 Industry Energy Inputs

	Trillion BTUs	Percent
Purchased Fuels and Electric Energy	428.0	100.0
Purchased Electric Energy	180.6	42.2
Purchased Fuels	247.4	57.8

Source: Energy use estimated from data from the U.S. Bureau of the Census, *2004 Annual Survey of Manufactures, Statistics for Industry Groups and Industries.*

Part B

Energy Inputs for the Fabricated Metal Product Model Plant

	Million BTUs	Percent
Purchased Electricity	8,368.8	42.2
	(2,452,755 kWhs)	
Natural Gas	11,462.5	57.8
Total Energy Inputs	19,831.3	100.0

Source: Calculated from data in Table 12 and Part A of this table.

manufacture is estimated to be $7,177,910 and the total annual output (value of shipments) is estimated to be $13,346,363. Energy inputs are estimated at 19,831.3 million BTUs, with all energy inputs suppled by electricity and natural gas.

Energy Used in the Model Plant

The assumption that the model plant is representative of the industry as a whole leads to the assumption that energy used in the plant also should be characteristic of industry use patterns. Part A of Table 13 presents data estimating energy use for the industry in 2005. The estimated energy use for the model plant was derived using the ratio of energy inputs to industry value added. It was further assumed all energy inputs for the model plant are derived from electricity and natural gas.

Part B of Table 13 indicates the model plant, employing 50 production workers, will have annual energy inputs of 19,831.3 million BTUs. Electric energy inputs are estimated to be 8,368.8 million BTUs (2,452,755 kWhs), or 42.2 percent of the total energy inputs, while natural gas inputs are estimated at 11,462.5 million BTUs.

Labor-Related Costs

Labor costs in the fabricated metal product manufacturing industry are affected by several factors: wage rates, productivity of workers, fringe benefits, and unemployment insurance and workers' compensation costs. Table 14 includes data on wage rates for the states identified as alternative plant locations.

An analysis of state wage levels indicates Nebraska's production workers have hourly wage rates significantly below the alternative plant sites. For example, 2006 hourly wage rates for Nebraska production workers ($15.04) are 13.8 percent below the average wage rates for the other 15 states included as alternative plant locations.

Table 14

Average Hourly Earnings of Production Workers on Manufacturing Payrolls, Alternate Plant Locations

Plant Locations	2002	2006	Percent Change 2002–2006
Nebraska	**$14.05**	**$15.04**	**7.00**
California	14.89	15.95	7.10
Colorado	15.44	16.58	7.40
Illinois	14.99	16.03	6.90
Indiana	17.15	18.57	8.30
Iowa	15.32	16.40	7.00
Kansas	15.98	17.68	10.60
Massachusetts	16.25	18.26	12.40
Michigan	18.26	21.83	19.60
Minnesota	15.06	17.23	14.40
Missouri	16.80	17.16	2.10
New Jersey	15.19	16.55	9.00
New York	16.75	18.29	9.20
Ohio	17.49	19.16	9.50
Pennsylvania	14.75	15.37	4.20
Wisconsin	15.86	16.54	4.30

Source: U.S. Department of Labor, **www.bls.com**

Table 15

Other Labor Costs, Alternative Plant Locations

Plant Locations	Workers' Compensation Rates [a]	Unemployment Insurance Factors [b] Per Worker Costs	Tax Rate	Wage Base
	($)	($)	(%)	($)
Nebraska	**3.80**	**225.00**	**2.5**	**9,000**
California	8.34	308.00	4.4	7,000
Colorado	3.84	220.00	2.2	10,000
Illinois	4.28	529.00	4.6	11,500
Indiana	2.10	210.00	3.0	7,000
Iowa	3.10	352.00	1.6	22,000
Kansas	3.49	184.00	2.3	8,000
Massachusetts	2.79	546.00	3.9	14,000
Michigan	4.13	414.00	4.6	9,000
Minnesota	4.40	432.00	1.8	24,000
Missouri	4.90	242.00	2.2	11,000
New Jersey	4.73	399.00	1.5	26,600
New York	5.37	340.00	4.0	8,500
Ohio	4.12	234.00	2.6	9,000
Pennsylvania	4.53	432.00	5.4	8,000
Wisconsin	3.47	304.50	2.9	10,500

[a] Rates for all manufacturing classifications from: Actuarial & Technical Solutions, *Workers Compensation State Rankings, Manufacturing Industry Costs and Statutory Benefit Provisions,* 2006 Edition, October 2006.

[b] Unemployment Factors from: U.S. Department of Labor, Employment and Training Administration, *Unemployment Insurance Data Summary,* 4th Quarter 2006.

[c] Ohio not rated so assumed to equal national average.

Other associated costs contributing to the total labor-related wage bill are shown in Table 15. These costs include rates for unemployment insurance and workers' compensation.

The Nebraska costs for unemployment insurance and workers' compensation are significantly less than the other states. In the case of unemployment insurance contributions, the average cost per employee for the 15 alternative states is estimated at $343.10 or 1.5 times the Nebraska cost of $225.00. Insurance rates for workers' compensation average $4.24 per $100 of payroll for the 15 alternative states, 11.6 percent more than Nebraska's rate of $3.80.

Estimated annual labor-related costs for operating the model plant producing fabricated metal products are presented in Figure 8 and Table 16. These labor-related costs include direct wages paid to production workers and estimates of other labor-related costs, including costs of workers' compensation and unemployment insurance, social security, and other fringe benefits.

If located in Nebraska, the model plant has a significant labor cost advantage over the alternative locations. The Nebraska labor cost advantage reaches a high of $946,667 in annual savings when compared to Michigan. When compared to the average labor costs for the 15 alternative locations, Nebraska's annual labor cost advantage is $341,709 or 14.2 percent lower.

Energy Cost

The availability and cost of energy are increasingly important factors in the industrial location process. Rates for industrial electricity and natural gas for the alternative plant locations are presented in Table 17. For both energy sources, Nebraska's rates are substantially less than the alternative states. The average electric rate for a 1,000 kW billing demand with monthly usage of 400,000 kWhs for the 15 alternative plant sites is $0.0857 per kWh or 75.5 percent more than the Nebraska rate of $0.0488.

Table 16

Total Annual Labor-Related Costs for a Model Plant for the Fabricated Metal Product Manufacturing Subsector

Plant Location	Hourly Wage Rate	Number of Production Workers	Total Payroll	Workers' Compensation Insurance	Unemployment Insurance	Social Security [a]	Fringe Benefits[b]	Total Labor Costs	Cost Difference Other States (-) Nebraska	Cost Relative Other States (/) Nebraska
Nebraska	**$15.04**	**50**	**$1,504,000**	**$57,152**	**$11,250**	**$115,056**	**$383,790**	**$2,071,248**	**0**	**100.0**
California	15.95	50	1,595,000	133,023	15,400	122,018	407,011	2,272,452	201,204	109.7
Colorado	16.58	50	1,658,000	63,667	11,000	126,837	423,087	2,282,591	211,343	110.2
Illinois	16.03	50	1,603,000	68,608	26,450	122,630	409,053	2,229,741	158,493	107.7
Indiana	18.57	50	1,857,000	38,997	10,500	142,061	473,868	2,522,426	451,178	121.8
Iowa	16.40	50	1,640,000	50,840	17,600	125,460	418,494	2,252,394	181,146	108.7
Kansas	17.68	50	1,768,000	61,703	9,200	135,252	451,157	2,425,312	354,064	117.1
Massachusetts	18.26	50	1,826,000	50,945	27,300	139,689	465,958	2,509,892	438,644	121.2
Michigan	21.83	50	2,183,000	90,158	20,700	167,000	557,057	3,017,915	946,667	145.7
Minnesota	17.23	50	1,723,000	75,812	21,600	131,810	439,674	2,391,896	320,648	115.5
Missouri	17.16	50	1,716,000	84,084	12,100	131,274	437,888	2,381,346	310,098	115.0
New Jersey	16.55	50	1,655,000	78,282	19,950	126,608	422,322	2,302,162	230,914	111.1
New York	18.29	50	1,829,000	98,217	17,000	139,919	466,723	2,550,859	479,611	123.2
Ohio	19.16	50	1,916,000	78,939	11,700	146,574	488,924	2,642,137	570,889	127.6
Pennsylvania	15.37	50	1,537,000	69,626	21,600	117,581	392,211	2,138,018	66,770	103.2
Wisconsin	16.54	50	1,654,000	57,394	15,225	126,531	422,067	2,275,217	203,969	109.8

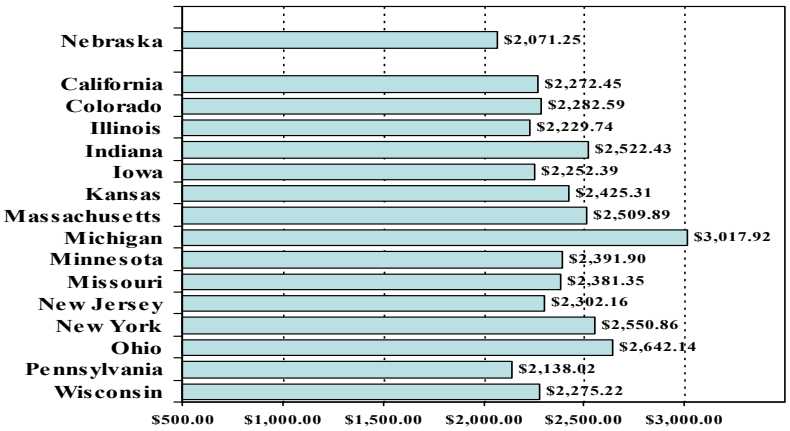
[a] Employer Social Security costs are 7.65 percent of payroll (wages).

[b] Fringe benefit costs include "paid leave," "supplemental pay," and "retirement and savings" payments and are assumed to be 25.5 percent of payroll.

Source: Compiled from data in Tables 12, 14, and 15.

Figure 8

Estimated Total Labor Costs* for a Fabricated Metal Product Model Plant, Alternative Plant Locations



(Labor Costs in Thousands of Dollars)

* Calculated labor costs include wages, workers' compensation insurance, unemployment insurance, social security, and fringe benefits.

Source: See Table 16.

Table 17

Industrial Rates for Electric Energy and Natural Gas Alternative Plant Locations

Plant Locations	Average Cost of Industrial Natural Gas, 2005 [(a)]	Cost of 1,000 kW Billing Demand With 400,000 kWh, 2006 [(b)]	
	($/MM BTU)	($/Monthly)	($/kWh)
Nebraska	**8.14**	**19,507**	**0.0488**
California	9.56	43,101	0.1078
Colorado	8.42	27,834	0.0696
Illinois	9.67	23,581	0.0590
Indiana	9.82	23,147	0.0579
Iowa	9.18	23,151	0.0579
Kansas	7.45	26,661	0.0667
Massachusetts	13.28	77,344	0.1934
Michigan	8.49	27,818	0.0695
Minnesota	8.25	25,006	0.0625
Missouri	10.67	20,106	0.0503
New Jersey	10.96	47,821	0.1196
New York	9.60	55,164	0.1379
Ohio	10.89	31,770	0.0794
Pennsylvania	10.97	34,021	0.0851
Wisconsin	9.62	27,276	0.0682

Sources:

[(a)] Natural Gas: American Gas Association, Gas Facts: 2005 data.

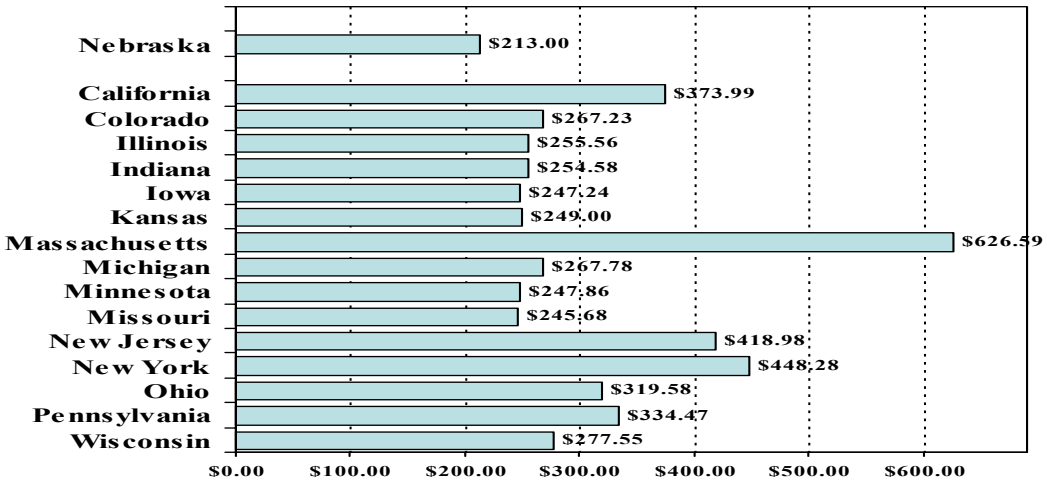
[(b)] Electric: Edison Electric Institute, "*Typical Bills and Average Rates Report,*" January 1, 2006 and July 21, 2006. State average weighted using eight months of January 2006 data and four months of July 2006 data. Nebraska data represent average for Nebraska Public Power District, Omaha Public Power District, and Lincoln Electric System using the same seasonal weighting.

In the case of industrial rates for natural gas, the average for the 15 other states is 20.3 percent more than the Nebraska rate of $8.14 per million BTUs.

Figure 9 and Table 18 provide an analysis of the energy costs for the operation of the model plant. The total energy costs for the alterative locations include the cost for the assumed level of electrical

Figure 9

Estimated Total Energy Costs* for a Fabricated Metal Product Model Plant, Alternative Plant Locations



(Energy Costs in Thousands of Dollars)

*Calculated energy costs include electricity and natural gas costs.

Source: See Table 18.

Table 18

Annual Energy Costs for a Fabricated Metal Product Model Plant

Plant Locations	Electricity Rate[a]	Electricity Cost	Natural Gas Rate[b]	Natural Gas Cost	Total Energy Cost	Cost Difference Other States (-) Nebraska	Cost Relative Other States (/) Nebraska
Nebraska	**$0.0488**	**$119,694**	**$8.14**	**$93,305**	**$212,999**	**$0**	**100.0**
California	0.1078	264,407	9.56	109,582	373,989	160,990	175.6
Colorado	0.0696	170,712	8.42	96,514	267,226	54,227	125.5
Illinois	0.0590	144,713	9.67	110,842	255,555	42,556	120.0
Indiana	0.0579	142,015	9.82	112,562	254,577	41,578	119.5
Iowa	0.0579	142,015	9.18	105,226	247,241	34,242	116.1
Kansas	0.0667	163,599	7.45	85,396	248,995	35,996	116.9
Massachusetts	0.1934	474,363	13.28	152,222	626,585	413,586	294.2
Michigan	0.0695	170,466	8.49	97,317	267,783	54,784	125.7
Minnesota	0.0625	153,297	8.25	94,566	247,863	34,864	116.4
Missouri	0.0503	123,374	10.67	122,305	245,679	32,680	115.3
New Jersey	0.1196	293,349	10.96	125,629	418,978	205,979	196.7
New York	0.1379	338,235	9.60	110,040	448,275	235,276	210.5
Ohio	0.0794	194,749	10.89	124,827	319,576	106,577	150.0
Pennsylvania	0.0851	208,729	10.97	125,744	334,473	121,474	157.0
Wisconsin	0.0682	167,278	9.62	110,269	277,547	64,548	130.3

[a] Electric rate is cost per kWh using the average per kWh cost for 1,000 kW monthly demand with 400,000 kWh of consumption. The model plant is assumed to use 2,452,755 kWh annually.

[b] Natural gas rate is per million BTUs. The model plant is assumed to use 11,462.5 million BTUs annually.

Source: Calculated from data presented in Tables 13 and 17.

energy and natural gas inputs for the operation of the plant.

Nebraska provides a significant energy cost savings compared to the alternative plant locations. When considering the Massachusetts location, energy costs for the model plant are almost three times (294.2 percent) the Nebraska energy costs. When compared to the average total energy costs for the 15 alternative states, Nebraska energy costs are 33.9 percent lower, translating into an average annual savings of $109,290.

Labor and Energy Cost Summary

Combining the labor and energy cost findings, the results of the model plant analysis are summarized in Table 19. As the table shows, the comparative annual cost advantage associated with a Nebraska location ranges from a low of $188,244, compared to the Pennsylvania plant site, to a high of $1,001,451 when compared to the Michigan site. When considering the average labor and energy costs for the 15 alternative states, the cost advantage of the Nebraska location is $451,000 annually, or 16.5 percent less than the average costs for the other 15 plant sites considered.

Conversely, the average labor and energy costs for the alternative states are 19.7 percent more than the costs associated with a Nebraska location. Inescapable from these results is the conclusion that, in terms of major labor and energy inputs costs, Nebraska fabricated metal product manufacturers have a clear competitive advantage over manufacturing establishments in the industry not so fortunately located.

Table 19

Summary of Labor and Energy Costs for a Fabricated Metal Product Model Plant

Plant Locations	Total Labor Cost	Total Energy Cost	Total Labor and Energy Cost	Cost Difference Other States (-) Nebraska	Cost Relative Other States (/) Nebraska
Nebraska	**$2,071,248**	**$212,999**	**$2,284,247**	**$0**	**100.0**
California	2,272,452	373,989	2,646,441	362,194	115.9
Colorado	2,282,591	267,226	2,549,817	265,570	111.6
Illinois	2,229,741	255,555	2,485,296	201,049	108.8
Indiana	2,522,426	254,577	2,777,003	492,756	121.6
Iowa	2,252,394	247,241	2,499,635	215,388	109.4
Kansas	2,425,312	248,995	2,674,307	390,060	117.1
Massachusetts	2,509,892	626,585	3,136,477	852,230	137.3
Michigan	3,017,915	267,783	3,285,698	1,001,451	143.8
Minnesota	2,391,896	247,863	2,639,759	355,512	115.6
Missouri	2,381,346	245,679	2,627,025	342,778	115.0
New Jersey	2,302,162	418,978	2,721,140	436,893	119.1
New York	2,550,859	448,275	2,999,134	714,887	131.3
Ohio	2,642,137	319,576	2,961,713	677,466	129.7
Pennsylvania	2,138,018	334,473	2,472,491	188,244	108.2
Wisconsin	2,275,217	277,547	2,552,764	268,517	111.8

Source: Calculated from data presented in Tables 13 and 15.

CONCLUSIONS

This study concludes the fabricated metal product manufacturing industry is desirable for Nebraska and a Nebraska location is desirable for the industry. The locational advantages Nebraska offers appear well-suited to fabricated metal product manufacturers. They cover a wide spectrum, ranging from an attractive business climate to a high quality of life at a relatively low cost. But, as the study's model plant analysis demonstrates, the competitive advantages Nebraska offers in such important cost areas as labor and energy are particularly noteworthy. The state's well-educated and productive labor force is a long-standing asset, as are its very favorable electric and natural gas rates.

Essentially, the analysis presented in this study was based on state-to-state comparisons applicable to the fabricated metal product manufacturing industry generally. Individual manufacturers will therefore need to further consider the locational requirements of their particular kinds of fabricated metal product manufacturing as well as the merits of specific sites within states. Certainly in terms of general locational situation for fabricated metal product manufacturers, Nebraska has much to offer.

The three organizations cooperating in the preparation of this study can also assist fabricated metal product manufacturers in assessing advantages in Nebraska for a specific new location or expansion project. Additional information concerning University of Nebraska resources and research assistance for fabricated metal product manufacturers is available from:

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NEBRASKA PUBLIC POWER DISTRICT
PO Box 499
Columbus, Nebraska 68602-0499
(402) 563-5534
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PO Box 94666
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APPENDIX A

The Nebraska Advantage consists of five "tiers" of investment and job creation activity. The following example spreadsheet illustrates the job creation and investment levels required and the tax incentives generated by Tier 2, which includes the jobs creation and investment required to the establishment of the model fabricated metal product manufacturing facility discussed in Part B of this report.

Nebraska Advantage - TIER 2

Minimum 30 New Jobs & $3 Million Investment

Potential Tax Credits and Refunds

Project Name

Date

NOTE: BLUE values require input of project-specific variables.

I. Compensation Credit - Percent of annual compensation paid to all new employees over 7 year period.

Potential Tax Credits and Refunds

A. Assumptions are as follows -

Number of New Employees in Year 1:	50
Average Annual Salary * :	$31,283
Initial payroll:	**$1,564,160**
Annual Cost-of-Living Increase beginning Year 2	3.00%

** Only positions earning at least 60% of the Nebraska Average Wage are eligible to earn Compensation Credit.*

	Employees	Payroll	Hourly Wage	Comp % *	Comp Credit
Year 1	50	$1,564,160	$15.04	4%	$62,566
Year 2	50	$1,611,085	$15.49	4%	$64,443
Year 3	50	$1,659,417	$15.96	4%	$66,377
Year 4	50	$1,709,200	$16.43	4%	$68,368
Year 5	50	$1,760,476	$16.93	4%	$70,419
Year 6	50	$1,813,290	$17.44	4%	$72,532
Year 7	50	$1,867,689	$17.96	4%	$74,708
Total		$11,985,317			**$479,413**

Compensation Tax Credit **$479,413**

*** Use Table below to determine appropriate Compensation Percentage for each year.**

NOTE: *Compensation credit can be used against employee withholding up to amount paid in.*

	2006 Neb Ave Wage	60% NAW	75% NAW	100% NAW	125% NAW
Annual	**$31,508**	$18,905	$23,631	$31,508	$39,385
Hourly	**$15.15**	$9.09	$11.36	$15.15	$18.94
Comp %		**3%**	**4%**	**5%**	**6%**

APPENDIX A – Continued

II. Investment Tax Credits and Sales Tax Refunds

A. Assumptions about project investment are as follows *

1.	Building Cost	
	A. OWN: Purchase/New Construction	$1,600,000
	OR	**OR**
	B. LEASE: Term of Lease Amount up to Ten Years	$0
2.	**Non-Manufacturing** Furniture, Fixtures and Equipment	$350,000
3.	Additional Investment (over 7 years)	$350,000
	Total investment subject to Sales and Use Tax over a 7 year period	**$2,300,000**
4.	**Manufacturing** Machinery and Equipment (Exempt from Sales Tax)	$2,500,000
	TOTAL PROJECT INVESTMENT	**$4,800,000**

* *Assumes values of building, equipment, furniture and fixtures are **PRIOR** to application of any state and local sales or use taxes.*

Note: *For LB312 investment calculations, existing equipment and furnishings brought into the state can be calculated at original purchase price, rather than at depreciated value.*

B. Sales Tax Refund

State Sales Tax Rate	5.5%
Local Sales Tax Rate *	1.0%
TOTAL SALES TAX RATE	**6.5%**

** Current Local Sales & Use Tax Rates can be found at http://www.revenue.state.ne.us/question/sales.htm*

1.	Building					
	$800,000	X	0.065	=	$52,000	
2.	Furniture, Fixtures and Equipment					
	$350,000	X	0.065	=	$22,750	
3.	Additional Investment (over 7 years)					Sales Tax Refund
	$350,000	X	0.065	=	$22,750	
	Total Sales Tax Refund:				**$97,500**	**$97,500**

C. Investment Credit:

Percent of investment in qualified property during 6-7 year entitlement period. Includes all investment in building, equipment and components. For leased space, investment is equal to annual lease rate times term of lease for up to 10 years. This credit may be applied to state corporate income tax liability or sales and use tax liabilities.

					Investment Tax Credit
$4,800,000	**x**	**10%**	**=**	**$480,000**	**$480,000**

TOTAL TAX CREDITS AND REFUNDS	**$1,056,913**
Savings from Sales Tax Exemption on Manufacturing Equipment	**$162,500**
TOTAL BENEFITS	**$1,219,413**

WAIVER of LIABILITY: Officials representing the Nebraska Department of Economic Development have prepared the enclosed estimates to determine the amount of any benefits that might become available for this project under the Nebraska Advantage tax incentive program. Be advised that these represent projected benefits. The Nebraska Department of Revenue will make a final determination of any tax incentives complimenting this project. The Nebraska Department of Economic Development and its representatives waive any financial responsibility for the accuracy of these numbers should they be relied upon by anyone outside this State agency.