

Employment and Economic Impacts of Transmission Line Construction in Montana

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One of the largest and most-enduring barriers to economic growth in Montana is the difficulty of transporting goods to consumer markets. Montana's rural nature and geography means that few consumer centers exist within our borders, and long distance and often treacherous terrain separate Montana from major shipping, trading, and consumer centers.

The transportation constraint is particularly felt by the Montana energy industry, where expansions to our electricity production capability are on hold until additional transmission lines can be built. Transmission lines from Montana to the large consumer markets on the West Coast are congested, meaning that guaranteed access to ship power on the line is fully allocated to existing generation. Development of additional production capacity, including new wind farms, is restricted until additional transmission lines to export power from Montana are completed.¹

Certain studies have suggested that the lack of transmission lines and resulting restriction on new generation sources constrains growth for all Montana businesses, not just the energy industry. Without additional power generation, any new or additional business activity will add to the existing demand for power and drive up energy costs for consumers and businesses alike. The Idaho National Laboratory recently estimated that failure to deliver potential wind, hydro, and coal generation in the Pacific Northwest region would result in electricity price increases of 40-50% as demand growth outpaces supply.² Many Montana businesses would have difficulty adjusting to these cost increases.

Of additional concern to many is the inability to expand Montana's budding renewable energy industry because of the lack of transmission capacity for wind power. Montana's wind resources are consistently ranked among the best in the nation, both because of the strength and reliability of Montana winds and because Montana's wind blows best in the winter and during the daytime when the demand for energy is greatest.³ There are 50 proposed wind farm projects in various stages of planning and development, but many of these projects will not be realized until adequate transmission is available.⁴

There are currently six major electricity transmission projects planned or under construction that would allow additional generation capacity in Montana. These projects include:

- the 300 MW Montana Alberta Tie Ltd. (MATL), which is currently under construction and would be the first direct connection between Alberta and Montana;
- the 3,000 MW TransCanada Chinook Line from Montana to Las Vegas;
- the 1,500 MW (north to south) Mountain States Transmission Intertie (MSTI) from Montana to Idaho;
- the NorthWestern Energy Feeder Interconnect Lines to link power resources within the state;
- the Grasslands Renewable Energy Feeder System; and
- the 700 MW upgrade to the existing 500 kV Colstrip line.

¹ Blend, Cartwright, and Nowakowski. 2010.

² McBride et al, 2008.

³ Energy Strategies. 2010.

⁴ Energy Promotion and Development Division, Montana Department of Commerce. 2010.

This research estimates the economic impact of constructing these lines. If all of these projects were constructed as planned, they could add approximately 6,400 MW of transmission capability to Montana's energy economy.⁵

However, barriers to the construction of these planned transmission projects remain plentiful. In addition to the difficulties of finding financing in the wake of the recent financial crisis, developers of the planned transmission lines face lengthy processes to gain public approval for the siting of transmission lines. For example, the proposed Mountain States Transmission Intertie (MSTI) project has experienced significant public resistance to its proposed route through Jefferson County, with opponents citing concerns about county planning rights, human health risks, energy price increases, and damage to the current agricultural economy, the landscape, and the area's scenic views.⁶

As a result of the public debate on the costs and benefits of transmission line construction, the Research and Analysis Bureau of the Montana Department of Labor and Industry was asked by impacted parties, county officials, state agencies, and energy businesses to provide an unbiased estimate of the workforce and economic impact to the state from building these transmission lines. The information in this report is limited to current employment and the short-term employment impact if the transmission lines are constructed as planned; it does not provide any information on long-term impacts or impacts that are unrelated to the workforce or the economy.

Current Employment and Production:

Montana currently has the capacity to produce 5,445 MW of electricity in the summer, but actual production levels average below this level. In 2007, Montana produced 3,288 aMW. In the same year, Montana consumed 1,909 aMW (including transmission losses), leaving 1,379 aMW to be exported out of state as a value-added export. In 2009, 2,483 workers were employed in the electric power generation, transmission, and distribution industry with approximately \$200 million paid in total wages. Approximately 70% of these workers were involved in the transmission of power, with the remainder involved in electric power generation.

In addition to power generation and transmission workers, there were 484 construction workers in the Power and Communication Line and Related Structures Constructions industry in 2009, down about 100 workers from the 2007 level. The average wage in this industry was over \$65,300 in 2009, compared to the average wage in all industries of \$33,760.⁷ If workers in other construction industries could be trained to build transmission lines, the construction could provide much-needed jobs to these workers, many of whom have lost employment during the current recession. Over 30% of the state's construction jobs have been lost since the start of the recession in December 2007.⁸

⁵ Energy Strategies, 2010.

⁶ Byron, 2010.

⁷ Employment and wage data from the Quarterly Census of Employment and Wages, 2009 preliminary data.

⁸ Job loss calculated from the June estimates of the Current Employment Statistics published by the Bureau of Labor Statistics and the Research and Analysis Bureau, Montana Department of Labor and Industry.

Methodology of the Estimated Economic Impact:

The estimated employment impacts resulting from the construction of transmission lines were developed through input-output analysis using IMPLAN software with 2008 industry data. Further information on developing input-output analysis can be found by reviewing the suggested methodology for assessing economic development impacts for wind energy projects posted on the U.S. Department of Energy's (DOE) website⁹. The use of IMPLAN to develop employment estimates of this type is fairly standard across industries, including transmission lines. In fact, a review of the economic impact statements for several proposed transmission lines across the nation, including some in Montana, revealed that IMPLAN or similar input-output analysis was regularly used to develop employment impacts.¹⁰

This research found that transmission projects utilizing an out-of-state contracting firm result in approximately 1.20 direct jobs per million dollars of capital expenditure, and an additional 0.75 jobs from related businesses and the spending of worker's wages, for a total of 1.95 jobs per million dollars in capital expenditure. In comparison, the transmission projects utilizing a local contractor resulted in 2.45 direct jobs and 4.70 total jobs per million dollars of capital expenditure. These figures are derived from calculating the impact of each planned construction line separately, then averaging the results to generate the general results shown in Table 1. The impact of individual lines is shown in Table 3.

	Direct Jobs per Million Capital Expenditure	Induced and Indirect Jobs per Million Capital Expenditure	Total Jobs per million Capital Expenditure	Total Economic Impact per Dollar of Capital Expenditure
Out-of-state Contracting Firm	1.20	0.75	1.95	\$ 0.19
In-state Contracting Firm	2.45	2.25	4.70	\$ 0.59

Region of Study and its Impact on Estimates:

The difference between the employment estimates developed in this research compared to those in the regulatory documents is an issue of geographical region, rather than method. The regulatory documents estimate the employment impacts at the county level, while this research includes employment impacts throughout the state. Analysis at the state level, rather than at the county level, will result in higher employment estimates and greater economic impact because a greater percentage of the capital investment is spent within the region.

⁹ NWCC, 2003

¹⁰ MATL, 2008. MSTI, 2008. US DOE, 2009. Consolidated Edison Company, 2006. Moore, undated.

The outcome of a state-level versus county-level impact analysis is likely best illustrated by an example. The regulatory documents for the Montana Alberta Tie Line (MATL) estimated the socioeconomic impact of constructing the transmission line on the counties of Cascade, Chouteau, Glacier, Pondera, Teton, and Toole Counties. Most of these counties are rural without a large and diverse labor force that includes expertise on building transmission lines. Therefore, the regulatory documents assumed that the majority of the construction labor force would come from outside the six-county area, and only a few local workers would be impacted. Further, these counties do not include businesses that manufacture the poles, wire, concrete, or other inputs used in transmission line construction. Therefore, the six-county area will not receive large benefits from the increased demand for the transmission line inputs. Because the region of study included only these six counties, the estimated employment impacts of constructing the MATL line were small and only included the impacts of spending on hotels and accommodations by a transitory workforce.

In contrast, this research estimates the employment impacts to the full state of Montana, not just to the six counties where construction actually occurs. Because the region is bigger, there is a greater likelihood that the workers and inputs used in the construction of the MATL line are counted in the economic impact estimate. For example, the MATL line is utilizing an in-state construction company from Lewis and Clark County, Rocky Mountain Contractors, Inc., as the project's general contractor.¹¹ This contractor hires Montana workers – many located in Helena. If the region of study was the six-county area highlighted in the regulatory documents, the employees of Rocky Mountain Contractors would not be included in the employment impacts. But because the region used for this study is the full state of Montana, these workers are included.

The employment impacts included in this estimate also include workers in upstream businesses that supply inputs to the transmission line construction. For example, Rocky Mountain Contractors hired an engineering firm in Billings, Power Engineers, as a subcontractor.¹² Because Billings falls outside the six-county region analyzed in the regulatory documents, the employees of Power Engineers would not be included in the regulatory analysis. However, in this analysis that included the full state of Montana, Power Engineer's employees are included in this employment estimate.

In summary, the economic and employment impact estimates of transmission line construction included in this paper includes impacts to the full state of Montana, not just to the counties in which the transmission line is constructed, which allows the spending on Montana inputs and workers to be captured in the analysis. The inclusion of input spending makes a large difference in the employment estimates; the employment estimates for the MSTI line for the more restrictive county region was approximately 200 workers, while the statewide estimate that includes the input spending is approximately 1,200. In other words, the employment estimates are highly dependent on whether the workers and inputs are sourced from within the analysis region.

¹¹ Puckett, 2009.

¹² Puckett, 2009.

Availability of Inputs in Montana:

The size of the economic impact from transmission projects is highly dependent on whether Montana businesses are chosen to be the primary contractor, engineers, and suppliers. Based on discussions with industry experts and a review of similar studies on regional economic impacts of transmission line construction, the selection of a local contractor is more likely for smaller in-state transmission lines.¹³ Higher-capacity transmission lines require highly-specialized workers and the ability to directly contract with manufacturers to supply inputs. Bigger projects (in terms of miles and expenditure) also may be too large for the average Montana contractor, who may not have the staff, resources, experience, or supplier relationships to handle large transmission projects. Finally, some research suggests that economies of scale exist in transmission line construction, which would result in a few large firms with the capability of handling major projects.¹⁴

The selection of a local contractor also increases the likelihood that in-state engineering firms, legal firms, and other suppliers are used because profitable business relationships already exist between the in-state firms. In contrast, larger out-of-state firms likely have business relationships directly with the manufacturer of the needed inputs and have their own engineers and legal staff in-house. Therefore, two extremes develop: larger transmission projects utilize out-of-state suppliers and labor and therefore have a smaller impact per mile or per investment dollar (although possibly larger overall due to the size of the project), while smaller transmission projects may be completed by an in-state firm utilizing in-state suppliers and workers and therefore have a larger impact per mile or investment dollar.

Therefore, this research used a separate analysis for the transmission lines that were larger and more likely to use an out-of-state contractor. The MATL line, and the smaller collector lines and upgrades planned by Northwestern Energy were assumed to use in-state contractors. In fact, the model assumed that some of Northwestern's existing staff and equipment would be used for the upgrades. The MSTI, the Grasslands project, and the TransCanada Chinook line were assumed to use out-of-state contractors.

However, even with the selection of an in-state contractor, there are still economic impacts that are lost because the money is spent on inputs sourced outside the state's borders. For example, there are not any Montana companies that manufacture the type of wire needed for high-voltage transmission lines. The wire manufacturing jobs associated with the transmission line would not be included in the estimate because these jobs occur outside the state of Montana. Using the Bureau of Labor Statistics AutoNAICS program, internal data from Montana's Unemployment Insurance Program, and the Montana Manufacturers Information System, this research found that there were several transmission line inputs that are not available in Montana. The results of this review are in Table 2.

From discussions with the contractor for the Montana Alberta Tie, Ltd (MATL) transmission line, wholesalers are not used when purchasing these products from out-of-state manufacturers, so the only impacts to Montana businesses from these purchases would be the transportation of the goods to the worksite. These transportation costs are minimal as the contractor fulfills this

¹³ Cox, 2006 and 2010.. Clark, 2010. Haider, 2010. Mills et al 2009. NorthStar Economics, 2009.

¹⁴ Mills et al, 2009. NorthStar Economics, 2009.

job duty internally. There are also inputs like concrete and equipment rental that are available in Montana, but not in the quantity or specific product needed for the transmission line product. Contractors must obtain the right quantity and type of product from an out-of-state business. As more transmission lines are built in Montana, there may be manufacturers that relocate in Montana or that re-tool existing Montana manufacturing plants to meet the demand for these materials. However, these estimates consider only current resources and firms. Therefore, even with a Montana contractor, much of the economic impact of the project occurs outside the state.

Table 2: NAICS Classification of Transmission Line Activity

Business Activity	NAICS	NAICS Title	Is there a Montana Company in this Industry?
Transmission of electric power	221121	Electric Power Transmission and Control	Yes
Transmission and distribution line Construction	237130	Power and Communication Line and Related Structures Construction	Yes (only 2 with >50 employees)
Transmission tower sections, fabricated structural metal, manufacturing	332312	Fabricated Structural Metal Manufacturing	Yes, but none that specialize in towers
Transmission and distribution voltage regulators manufacturing	335311	Power, Distribution, and Specialty Transformer Manufacturing	No
Transmission pole and line hardware manufacturing	335932	Noncurrent-Carrying Wiring Device Manufacturing	No
Transmission equipment, electrical, merchant wholesalers	423610	Electrical Apparatus and Equipment, Wiring Supplies, and Related Equipment Merchant Wholesalers	Yes

Source: U.S. Department of Labor, 2007. Montana Department of Labor, Research and Analysis Bureau.

In discussions with industry experts, policy makers, and engineers, concerns were voiced whether Montana’s workforce is adequately skilled to construct transmission lines. Although the skill set for electricians and other workers on transmission lines is highly specialized, the local electrical workers union requires all of its members to be fully-trained in all aspects of electrical work, including the construction of transmission lines. The IBEW local #44 in Butte will be used to source all of the electrical workers on the MATL line, and officials from the union argued that their Montana union members had experience working across the U.S. building large transmission lines.¹⁵ Based on this information, this research assumed that in-state firms would use in-state workers, which results in a larger impact because these workers dispose of their

¹⁵ Flynn, 2010.

earnings primarily within the state. Out-of-state firms will likely bring their existing workforce into the state, so the impact from these out-of-state workers was limited to spending on lodging, food, retail, and entertainment.

Transmission line construction will also require some temporary construction hires that have less specific construction skills, but will need to operate heavy machinery and complete general construction projects. The transmission line projects will likely find an ample supply of available general construction labor due to the large numbers of construction workers who have lost their jobs during the current recession. Over 9,000 jobs were lost in the construction industry between 2007 and 2009, resulting in a large supply of under-utilized labor.¹⁶

Estimated Economic Impacts of Transmission Line Construction:

For most of the transmission projects considered in this research, it is likely that an out-of-state contracting firm will be utilized. The economic impacts estimates for the MSTI, Chinook, and Grasslands projects reflect this assumption. For the MATL line and the Northwestern Energy collector lines and upgrades, it was assumed that in-state contractor firms were used. The MATL line has already chosen an in-state contractor. Northwestern Energy has a substantial amount of existing business in Montana and is more likely to retain ties to the state by hiring an in-state contractor. It was also assumed that Northwestern Energy utilized some of its existing transmission line maintenance staff and equipment in the transmission projects.

This research adopts a ‘production function’ approach to estimating the economic impact to Montana, which means that the total amount of money spent on the project was divided into different industries that experienced increases in the final demand. The estimate is presented as if the spending and economic impact were spread evenly over the timeframe of the project. However, it is more likely that the project costs and impact are front-loaded, with the majority of the inputs and materials being purchased in the first year of the project, but the labor costs spread evenly over the full timeframe. Table 3 presents the estimates for jobs and total impact for each project.

Table 3: Economic Impact Estimates for Montana Transmission Projects								
Project	2007 Real Dollars of Montana Capital Expenditure	Instate/Out-of-State	Direct Jobs	Direct Jobs per Year	Total Jobs	Total Jobs per Year	Direct Impact (2010 Dollars)	Total Impact (2010 Dollars)
Mountain States Transmission Intertie	\$ 616,431,000	Out	742	186	1,203	301	68,865,272	120,046,544
Montana Alberta Tie Line	\$ 162,132,000	In	360	180	720	360	52,492,984	92,173,816
NWE Collectors	\$ 842,455,000	In	2,082	416	3,980	796	272,759,520	482,279,520
Grasslands	\$ 1,474,639,000	Out	1,776	592	2,878	959	164,735,952	287,169,472
TransCanada Chinook Line	\$ 939,502,000	Out	1,131	283	1,833	458	104,947,160	182,945,424
NorthWestern Upgrades (Colstrip)	\$ 215,751,000	In	546	273	1,034	517	86,951,160	140,643,872

Table 3 summarizes the economic impact of transmission lines in Montana in 2010 dollars. The direct spending represents initial impact of the project on the industries involved in constructing and repairing the transmission line, plus any direct spending by out-of-state workers. The direct spending is less than the project cost because significant inputs are purchased outside the state.

¹⁶ Quarterly Census of Employment and Wages, 2007 4th quarter to 2009 4th quarter.

The total output column in Table 3 represents the total economic impact of the project on the Montana economy. This figure includes the direct impact on the businesses involved in the transmission project, the indirect impact on suppliers of these industries that will experience increased demand for their products, plus the increased demand on seemingly unrelated industries from an increase in the region's income. The total impact includes additional spending in the retail, food, and consumption industries that arise from greater incomes and additional workers in the state.

Table 3 also includes an estimate for the direct and total employment associated with each transmission line project. The direct employment refers to the increase in employment directly related to the transmission line project. However, the increased economic activity also creates indirect jobs in businesses that supply inputs to the directly affected industries, such as businesses that supply parts to machinery manufacturers that provide equipment to the transmission line project. Further, the increase in income in the region also creates jobs in consumer industries. The total job figure includes all jobs that result from the transmission line spending, including the jobs directly building the transmission line, the jobs in upstream and downstream suppliers of the businesses building the transmission line, and the jobs from increased spending in the area.

Comparison of Estimates to Similar Studies:

Although these estimates appear high when compared to the county-level estimates included in the regulatory documents, they are actually quite conservative when compared to studies that used a similar approach and a larger region. The \$1.1 billion transmission line under construction in Kansas, Oklahoma, and the Texas Panhandle was estimated by the Southwest Power Pool to provide 7,475 transmission jobs, while the McNary-John Day line constructed by the Bonneville Power Administration on the border of Washington and Oregon was estimated to create 700 construction jobs with \$246 million in capital expenditure.¹⁷ In comparison, the Grasslands project has a greater capital expenditure, but lower job estimates than the Southwest Power Pool project. The McNary-John Day line has similar capital expenditures to the NorthWestern Upgrades, but the employment estimate is higher by about 120 jobs.

Further Details on Methodology:

The capital investment amount used in this analysis came from the Energy Promotion and Development Office at the Montana Department of Commerce. Many of the transmission lines considered in this research crossed the Montana border and continued to energy markets out-of-state. This research considered the economic impact of the Montana portion of the line only by allocating the total spending on a per mile basis, then multiplying by the number of miles in Montana (versus other states). This allocation method includes an implicit assumption that each mile of transmission line has the same cost, even though some portions of the transmission line that cross difficult terrain may have higher costs per mile.

¹⁷ Cox, 2010.

In order to develop input-output multipliers for transmission line projects, the Montana portion of the capital investment was divided into the industries that experience an increase in demand using the spending schema from a 2009 study by NorthStar Economics, Inc. for an economic impact assessment of a 138-kilovolt transmission line project in Wisconsin. The NorthStar industry breakdown, categorized by 2007 IMPLAN industry schema, can be found in Appendix A. Using the schema from the NorthStar research requires an assumption that the inputs and industry spending to produce a small transmission line in Wisconsin are typical of all transmission line projects in Montana. Conversations with industry experts indicated that some adjustments to the spending patterns were needed to conform to Montana projects.¹⁸ Further, an adjusted funding schema was developed for upgrades that assumed that NorthWestern Energy would use some existing staff and equipment and some of the materials would be reused. The upgrades spending pattern reduces the amount spent on materials and rental equipment, and focuses more funding into the transmission industry. The spending patterns used in this analysis are shown in Table 4.

Table 4: Transmission Line Construction Spending by Industry and Percent of Inputs Purchased in Montana						
IMPLAN 3 Sector		Percent of Spending		Percent Spent in Montana		
		New Lines	Upgrades	Instate Contractor Used	Out-of-State Contractor	
3162	Preformed Concrete	0.12%	0.12%	0%	0%	
3186	Steel Structures	2.82%	1.82%	0%	0%	
3266	Electrical materials	35.78%	28.78%	0%	0%	
3272	Cables and materials	27.39%	27.39%	0%	0%	
3360	Real Estate	0.61%	0.61%	100%	100%	
3387	Fencing and Security	0.13%	0.13%	100%	100%	
10005	Miscellaneous services and damages	0.02%	0.02%	100%	100%	
31	Electricity Transmission and Distribution	0.00%	12.00%	100%	100%	
36	Construction Services	12.88%	5.44%	100%	0%	
39	Maintenance and Repair of Nonresidential Structures	0.00%	5.44%	100%	0%	
330	Miscellaneous Materials	0.01%	0.01%	100%	100%	
365	Equipment rental	6.33%	4.33%	90%	50%	
369	Engineering and consultants	11.89%	11.89%	66%	10%	
374	Management Consultants	0.25%	0.25%	66%	10%	
375	Mapping and Environmental Consultants	0.06%	0.06%	66%	10%	
376	Research	0.09%	0.09%	66%	10%	
377	Advertising and Printing	0.34%	0.34%	100%	40%	
378	Signage	0.03%	0.03%	100%	100%	
382	Temp Hires	0.61%	0.61%	100%	100%	
432	Fees	0.64%	0.64%	100%	100%	

Readers familiar with economic theory will recognize Table 4 as a linear production function. However, there is reason to believe that the actual production function for transmission lines is

¹⁸ Darkenwald, 2010. Haider, 2010.

non-linear in some of the physical inputs, resulting in estimate error that increases as the size of the transmission line increases. In other words, larger transmission lines may spend a smaller percentage of their capital expenditure on engineering or consulting services, and a greater percentage of their expenditure on physical inputs like steel structures, concrete, and wire. Because this research assumes that the percentage spending on each input remains the same regardless of the size of the line, the model may be very effective in estimating the employment impacts of smaller lines, but not of larger lines.

Table 4 also displays the percentage of each input that was assumed to be purchased within the state of Montana based on the availability of in-state suppliers (shown in Table 2) and the in-state purchases of the MATL line. As mentioned above, the estimates are highly sensitive to changes in the in-state purchase assumptions. The assumptions shown in Table 4 were developed after significant review of other literature and conversations with industry experts. These percentages were also reviewed by engineers involved in the MSTI line to ensure they were reasonable. In comparison to other research, the in-state spending on Montana's lines was conservative. NorthStar Economics found that approximately 45.8% of the costs to construct the Wisconsin transmission line remained in the state. This analysis assumed less than 30% of the spending remained in the state if an in-state construction company was used. If an out-of-state company was used as the general contractor, the amount remaining in-state was around 11%.

If an out-of-state construction firm was used, this study accounted for the in-state spending of the temporary construction workforce by assuming spending of \$100 per worker per day on food, beverages, lodging, miscellaneous retail, entertainment, and personal care services. The \$100 per day level is based on the consumption patterns of households earning \$50,000 to \$75,000 annually (the average pay for the industry is \$65,300). Additional details on this spending pattern can be found in Appendix B. According to the IBEW local union, the out-of-state construction firms would still have Montana workers on their staff as Montana electricians work all over the country.¹⁹ Therefore, the \$100 per day per worker would be an underestimate of the impact of the construction workforce because the Montana workers on the workforce would spend more of their salaries within the state, not just \$100 per day.

Conclusion

In response to requests from interested parties, the Research and Analysis Bureau was asked to produce estimates of the short-term economic and employment impact of six transmission line construction projects to the Montana economy. This research found that the economic impact was highly dependent on whether the contracting firm used was a Montana company. For projects utilizing an in-state firm, about 2.5 jobs directly involved with the project are created for every million dollars in capital investment, with an additional 2.2 jobs created from in unrelated industries due to additional money being spent in the Montana economy. If the contractor was from out-of-state, the jobs impact was significantly less, with 1.2 direct jobs and 0.75 indirect jobs for every million of capital expenditure.

¹⁹ Flynn, 2010.

Appendix A- NorthStar Spending Patterns

The NorthStar research only provided multipliers for the payments made to in-state entities. However, the report included a description of the payments to out-of-state entities. These payments were added back into the industry schema. Adding this funding into the model is appropriate because the IMPLAN model allows for adjustment for the amount of spending out of state, so these amounts do not need to be removed prior to developing the model. The industry breakdown is shown in the 2007 440 IMPLAN sector scheme. This NorthStar spending pattern was adjusted after conversations with engineers to adjust the spending for Montana’s transmission lines.

Appendix A Table: Industry Breakdown of Inputs for Transmission Line in NorthStar Research			
2007 IMPLAN Sector	Sector Description	Product or Service	Percent of Project Spending
31	Electric power generation, transmission, and distribution	Energy Construction Services	19.10%
36	Construction of other new nonresidential structures	Civil and heavy construction	6.02%
39	Maintenance and repair construction of nonresidential structures	Fencing	0.13%
163	Other concrete product manufacturing	Preformed concrete	0.12%
171	Steel product manufacturing from purchased steel	Steel poles and accessories	2.76%
207	Other industrial machinery manufacturing	Circuit breakers	2.52%
266	Power, distribution, and specialty transformer manufacturing	Transformers, electronic equipment, materials	21.65%
272	Communication and energy wire and cable manufacturing	Cables and materials	27.22%
275	All other miscellaneous electrical equipment and component manufacturing	Materials	0.06%
319	Wholesale trade	Substation batteries	0.08%
351	Telecommunications	Cable and communication equipment	0.19%
360	Real estate	Real estate	0.61%
363	General and consumer goods rental	Meeting space	0.01%
365	Commercial and industrial machinery and equipment rental and leasing	Transformer moving and other rental equipment	5.78%
369	Architectural, engineering, and related services	Engineering and other consultants	11.81%

374	Management, scientific, and technical consulting services	Mapping and environmental consulting services	0.07%
377	Advertising and related services	Public relations	0.35%
378	Photographic services	Signage	0.01%
380	All other miscellaneous professional, scientific, and technical services	Business consultants	0.25%
382	Employment services	Temporary hires	0.61%
426	Private households	Miscellaneous services and damages	0.02%
431	State and local government electric utilities	Regulatory fees	0.61%
432	State and local government enterprises	City and traffic fees	0.04%

Appendix B: Spending Patterns for Transitory Construction Workers Earning \$65,300

If an out-of-state construction firm is used, this research assumes that the majority of the workers used by the firm are out-of-state workers whose primary spending occurs outside of Montana. However, the worker will have living expenses when living in Montana during the construction period. This research summarized the per day spending of the transitory workforce as approximately \$100 per day per worker. The \$100 was divided into \$30 for Food and Drinking Establishments, \$25 for Entertainment, \$20 in Miscellaneous Retail, \$15 for Lodging, and \$10 for Personal Care Services. This is a simplification of the actual spending patterns of workers – a simplification consistent with other research that was done to ease model construction.

To check the validity of the amount of spending, IMPLAN was used to derive a daily spending pattern for construction workers earning \$65,300 annually. This pattern is shown in the chart below for all sectors with greater than \$1 of daily spending. IMPLAN indicates that households with \$50,000 to \$70,000 in income spend about 11.4% of their income on their dwellings, which translates into about \$20 a day. Some goods purchased by households are unlikely to be purchased by the transitional workforce within the state; these goods were removed from the spending pattern. For example, it is reasonable to expect that the workers may need health services, so the amount spent on hospital services was included. However, most workers will likely use clinics and emergency care while on the job, and wait to visit their regular doctor until they return home. Therefore, the amount spent in the offices of physicians was removed from the spending pattern. After removing spending likely done out of state, the daily amount summed to \$98.78. This amount was simplified by using \$100, and the industry distribution was simplified by using the spending pattern outlined above.

Appendix B: Spending Patterns for Workers Making \$65,300		
	Consumption pattern for \$50K to \$75K Households	Daily Amount Spent with \$65,300 salary (in Dollars)
Imputed rental services of owner-occupied dwellings	11.4%	20.37
Private hospital services	7.4%	13.31
Offices of physicians, dentists, and other health practitioners	5.2%	
Wholesale trade distribution services	5.0%	8.88
Restaurant, bar, and drinking place services	4.6%	8.30
Real estate buying and selling, leasing, managing, and related services	4.4%	
Insurance	3.1%	
Refined petroleum products	2.0%	3.50

Monetary authorities and depository credit intermediation services	1.6%	
Pharmaceutical preparations	1.6%	2.83
Telecommunications	1.6%	
Retail Services - Food and beverage	1.5%	2.76
Electricity, and distribution services	1.5%	2.75
Medical and diagnostic labs and outpatient and other ambulatory care services	1.5%	
Retail Services - General merchandise	1.4%	2.43
Education from private junior colleges, colleges, universities, and professional schools	1.3%	
Retail Services - Motor vehicle and parts	1.2%	2.15
Amusement parks, arcades, and gambling recreation	1.2%	2.11
Automobiles	1.1%	1.95
Light trucks and utility vehicles	1.1%	
Retail Services - Nonstore, direct and electronic sales	1.0%	1.83
Retail Services - Building material and garden supply	0.9%	1.67
Retail Services - Clothing and clothing accessories	0.9%	1.66
Funds, trusts, and other financial services	0.9%	
Legal services	0.9%	
Automotive repair and maintenance services, except car washes	0.8%	1.51
Air transportation services	0.7%	1.27
Retail Services - Health and personal care	0.7%	1.22
Services from religious organizations	0.7%	
Retail Services - Gasoline stations	0.7%	1.19
Home health care services	0.7%	
Individual and family services	0.6%	
Soft drinks and manufactured ice	0.6%	1.12
Womens and girls cut and sewn apparel	0.6%	
Cigarettes, cigars, smoking and chewing tobacco, and reconstituted tobacco	0.6%	1.04
Audio and video equipment	0.6%	
Other personal services	0.6%	1.04

Source: Consumption Pattern from 2010 IMPLAN Group, Inc., Wages from the Quarterly Census of Employment and Wages, 2009

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- Montana Major Facility Siting Act (MFSA) Application. Montana Alberta Tie Ltd. Project 230-kV AC Power Transmission Line. Lethbridge, Alberta – Great Falls, Montana. December 1, 2005.
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