



POWER ENGINEERS, INC.

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LETTER OF TRANSMITTAL

DATE November 7, 2025

TO Sam Lobby
Minnesota Public Utilities Commission

SUBJECT Laketown Independent Review Report

PROJECT NO. 0262728_0000

THESE ARE TRANSMITTED As Requested

	DWG # / DOC NAME	REV	DATE	COPIES	DESCRIPTION
1.	25-0151-19412_MPUC_Independent_Review.pdf	A	2025-11-07	1	Report
2.	25-0151-19412_GRE_Alt-B_Greenfield_Breaker_Station_Estimate.pdf	A	2025-11-07	1	Station Estimate Attachment

Sam,

POWER Engineers has uploaded our independent review report for the Laketown 115 kV Transmission Line relating to the Minnesota Public Utilities Commission Docket No. ET-2/TL-24-132.

Sincerely,

Chris Mouw, PE
Sr Engineer

Enclosures: 2
Sent Via: E-mail
c: Paul Hennen (POWER-DEN)
Chris Goulet (POWER-ORL)

IF ENCLOSURES ARE NOT AS NOTED, PLEASE NOTIFY US AT ONCE.

November 7, 2025

GREAT RIVER ENERGY

MPUC Laketown Independent Review *POWER Engineers Independent Review*

Revision A

PROJECT NUMBER:
0262728_0000

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POWER ENGINEERS INDEPENDENT REVIEW

PREPARED FOR:
GREAT RIVER ENERGY

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REVISION HISTORY						
REV.	ISSUE DATE	ISSUED FOR	R	CHKD BY	APPD BY	NOTES
A	11-07-2025	Record	CG	MLP	CP	Issued for record

"Issued For" Definitions:

- "Prelim" means this document is issued for preliminary review, not for implementation
- "Appvl" means this document is issued for review and approval, not for implementation
- "Impl" means this document is issued for implementation
- "Record" means this document is issued after project completion for project file

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EXECUTIVE SUMMARY

POWER Engineers, Inc. (POWER) was asked by Great River Energy (GRE) to perform an independent review of the 115 kV Laketown Transmission Line reliability assessment for the considered options under MPUC Docket No. ET2/TL-24-132. The proposed Laketown 115 kV transmission line is in Carver County, Minnesota. The Minnesota Public Utility Commission (MPUC) asked for an independent review of the reliability concerns for Route Alternative B, the steps needed to address those reliability concerns, and estimated costs of the two route options.

POWER performed a thorough review of the reports and material provided by GRE and MPUC. From a reliability perspective, the proposed Laketown 115 kV line configuration would lessen the likelihood of outages for local customers compared to Route Alternative B. In the future, Route Alternative B could require a costly new greenfield breaker substation to provide system load separation similar to the proposed route, nullifying any short-term cost savings from the shorter line. From a cost perspective, POWER determined that the transmission line and greenfield substation estimates provided by GRE were reasonable and align with POWER's own estimate assessments.

PROJECT BACKGROUND

GRE performed a System Impact Study for Minnesota Valley Electric Cooperative (MVEC) for a new Laketown Interconnection on October 16, 2023, with a revised report on October 14, 2024. This report stated that the new Laketown 115 kV substation is being proposed due to increasing load growth in the area between Waconia and Victoria, north of Airport Road, in MVEC's service territory. The new 115 kV transmission line to feed the proposed 115 kV Laketown substation is located in Carver County, Minnesota.

On October 2, 2025, MPUC released a new order, requiring the applicants (GRE and MVEC) to provide more description of the following topics: (1) the reliability concerns for Route Alternative B; (2) the steps necessary to address those concerns; (3) all cost impacts of making distribution system modifications; and (4) the elements that make up the cost estimates the Applicants provided for achieving a similar reliability for the two route options. MPUC also required that the applicants retain an independent engineering consultant to analyze these issues, which is the purpose of this report.

GRE released their supplemental information request response on October 9, 2025, addressing the topics requested by MPUC.

ROUTE RELIABILITY

For the purpose of this review, POWER defines reliability of electrical service to be the ability of the electric grid to maintain continuous and stable power delivery. One feature of reliability is minimizing the amount of customers, or load, to be lost in the event of a contingency. Another relevant feature of reliability is minimizing the amount of time that contingencies last for customers. Both features of reliability will be reviewed in this section of the report as the two route options are considered.

Existing Conditions

Loading

POWER was able to confirm the Xcel Energy loading per the MTEP 24 2026 model data for both Lake Bavaria Substation (17.92 MW) and West Creek Substation (21.2 MW). The loading of MVEC's substations, Augusta and Victoria, with projected loads of 15.8 MW and 14.2 MW, respectively, was larger than the loadings reflected in the MTEP 24 2026 summer peak planning base case. POWER was able to confirm with GRE that MVEC provided these loading projections themselves. Since the loading of the Augusta and Victoria Substations provided by MVEC is larger than what was in the MTEP case, this is likely more accurate for the worst-case regional loading being considered in this review.

Mileage

The MTEP 24 2026 model data generally lines up with the GRE provided existing line length between the Waconia and Scott County Substations being 22.6 miles. The length of the line West Creek to Scott Co is missing in the planning base case. Extrapolating the resistance of that line leads to a total length of the line of 20.3 miles, which is relatively close to GRE's given line length.

MW-Mile

Assuming that the GRE and MVEC loading and mileage data is correct, the total MW-mile value of 1,565 for the existing system is correct. Per GRE's TDOG-108 planning criteria, values above 1000 MW-miles are higher than usual.

Proposed Transmission Line Route Reliability

The proposed route of the 115 kV transmission line to serve the new Laketown substation cuts into the existing 115 kV W. Waconia – Scott County transmission line between the Augusta and Lake Bavaria taps. In this plan, the proposed 115 kV Laketown substation would include a bus-tie circuit breaker which would split the 115 kV W. Waconia – Scott County transmission line nearly in half, with the west circuit measuring 17.6 miles and the east circuit measuring 13.7 miles. Despite the nearly even split lengthwise, the load split in this proposal is less even. The west circuit would have a 2026 projected load of 16.3 MW while the east circuit would have a 2026 projected load of 52.8 MW. This setup, however, would evenly split the MVEC-specific load along the line. The proposed route would decrease the MW-mile values for each side of the line: the west circuit would be 286 MW-miles and the east circuit would be 723 MW-miles. POWER confirmed that the line lengths, loadings, and MW-mile values given by GRE are reasonable for this route.

The major benefit of adding the bus-tie circuit breaker is that if there were a fault or some other issue along the W. Waconia – Scott County line, only one part of the line would trip off, and the other part would be unaffected. This would increase the reliability for all customers along the line. In addition, this configuration splits up the MVEC substations along this line, with the Augusta Substation on the west circuit, the Victoria Substation on the east circuit, and the new Laketown Substation on both circuits with a 115/12.47 kV distribution transformer on either side of the bus-tie circuit breaker. The distribution feeders for GVEC customers could be tied between each side of the bus-tie circuit breaker. For example, a feeder originating from Victoria Substation (on the east circuit) could have a normally open emergency switch (or recloser) connecting it to a feeder originating from the west circuit at Laketown. Even if there were an issue with one side of the transmission line, the MVEC customers could be back-fed on their distribution feeders through the unaffected portion of the transmission line, greatly minimizing long term outages.

Route Alternative B Reliability

The Route Alternative B of the 115 kV transmission line to serve the new Laketown substation cuts into the existing 115 kV W. Waconia – Scott County transmission line between W. Waconia and the Augusta tap. This route splits the 115 kV W. Waconia – Scott County transmission line less evenly than the proposed route, both by length and by loading. In this configuration, the west circuit is 12.5 miles long, while the east circuit is 16.5 miles long. The bigger difference is in the load split, with the west circuit only loaded at 4.3 MW while the east circuit is loaded at 64.8 MW. If a bus-tie circuit breaker were added to Laketown Substation in this configuration (which GRE is not proposing due to limited reliability benefits), the MW-mile value for the west and east circuits would be improved to 54 MW-miles and 1070 MW-miles, respectively. Without the bus-tie circuit breaker, the MW-mile value for the full 115 kV circuit would be 2005 MW-miles, indicating a high amount of exposure per GRE's TDOF-108 planning criteria. POWER confirmed that the line lengths, loadings, and MW-mile values given by GRE are reasonable for this route.

Route Alternative B does not provide the same reliability for the existing 115 kV W. Waconia – Scott County transmission line compared to the proposed route as the load would not be split as evenly, even if a breaker were to be added. Adding a bus-tie circuit breaker would be less effective in improving the reliability of the transmission line due to the very uneven load separation and slightly less even lengths of the east and west circuits on each side of the potential breaker, compared to the proposed route. For these reasons, GRE stated they would not install a bus-tie circuit breaker for this scenario. Even if a bus-tie breaker were included at Laketown Substation, back-feeding MVEC loads in this configuration would be more difficult, if not impossible for many loads, since only so many feeders from both Victoria and Augusta (and future Laketown transformer 2) could be tied with the few feeders from Laketown transformer 1.

A potential compromise that was not considered by GRE in their report for Route Alternative B was the benefit of including a 115 kV circuit breaker at the Laketown Substation as it proceeds to Augusta Substation (not between future Laketown transformers 1 and 2) to more evenly split load in the future. As the Laketown Substation load grows relative to the load on the rest of the W. Waconia – Scott County line, this breaker placement would split more of the load along the line to lessen the need for more reliability solutions. In addition, with this new transmission breaker placement, some of the MVEC distribution feeders could be tied together between the existing Victoria and Augusta substations and the new Laketown Substation (coming from both Laketown transformer 1 and future transformer 2). This would allow some customers to be back fed from the unaffected portion of the 115 kV W. Waconia – Scott County line in the event of a fault affecting one part of the line. This option would be less effective than the proposed solution as the load separation for MVEC customers would be uneven on either side of the breaker. Additionally, the greenfield breaker station discussed below would likely be a better long-term solution from a reliability perspective.

Greenfield Breaker Station Reliability

In the event that Route Alternative B is chosen, GRE has stated that a new greenfield breaker station would be required in the future to achieve similar load separation and reliability results as the proposed solution. POWER agrees that this would be a logical solution in the future if load growth continues in the local region. As GRE stated, it makes the most sense to locate this station at the three-way intersection of the 115 kV W. Waconia – Scott County line, to maximize the reliability of the local system with the investment of a new station.

The load and line length of the existing line would be divided three ways in this configuration, allowing for much lower MW-mile values for each of the three circuits in this configuration: 339 MW-miles for the west circuit, 136 MW-miles for the east circuit, and 57 MW-miles for the north circuit. POWER confirmed that the MW-mile values given by GRE are reasonable for this scenario.

At this point, GRE estimates that the need for a new breaker station would depend on load growth in the area (assuming Route Alternative B is chosen), and if load growth occurs as anticipated it would be needed in 10-15 years. A brand-new greenfield breaker station would be a very costly and inefficient solution compared to the proposed route and configuration.

Reliability Conclusions

The two options both meet the need to serve the growing load in the area between Waconia and Victoria, north of Airport Road. They differ, however, in terms of how many customers would likely be affected by an outage and how long an outage would last. The proposed route more evenly segments the load along the existing 115 kV W. Waconia – Scott County transmission line and allows for a circuit breaker to be placed strategically near a central location of the line. This is a cost-effective, sustainable solution which would alleviate the need for greenfield breaker station in the future, which GRE mentioned might be necessary for Alternative Route B. The proposed route decreases the likelihood of power outages for customers along the line. In addition, the proposed route allows for more options to restore customers through back feeding in the event of an outage, lessening outage durations. Route Alternative B does not connect the proposed Laketown Substation in a central location of the line and does not offer the same load segmentation and reliability benefits. Even placing a bus-tie circuit breaker at the new Substation would not enhance the reliability of the transmission system significantly under the Route Alternative B configuration.

COST ESTIMATE

Proposed Route Cost Estimate

Transmission Line

The transmission line cost estimate for the proposed 4.3 mile route is \$13.0M (about \$3 million per mile). This includes the cost of siting & land rights, engineering support, materials, and construction. This estimate is based on design assumptions provided by GRE using POWER's internal estimating tools. Please see Appendix A for the detailed estimate.

Distribution System Modifications

The transmission line estimate does not include any costs associated with distribution system modifications. The distribution system modification costs are minor compared to the cost of the transmission line.

Route Alternative B Cost Estimate

Transmission Line

The transmission line cost estimate for the 3.2 mile Route B is \$9.2M (about \$2.9 million per mile). This includes the cost of siting & land rights, engineering support, materials, and construction. Any transmission work associated with the additional breaker is not included. This estimate is based on design assumptions provided by GRE using POWER's internal estimating tools. Please see Appendix A for the detailed estimate.

Distribution System Modifications

The transmission line estimate does not include any costs associated with distribution system modifications. The distribution system modification costs are minor compared to the cost of the transmission line.

Greenfield Breaker Station Cost Estimate

An independent cost estimate for the possible addition of a 115kV greenfield breaker station was performed and resulted in a pre-contingency estimate of \$10.3M that was within 9% of the high-level estimate submitted by GRE. Since the estimate was based on limited data, it would be considered a conceptual estimate referred to commonly as a Class 4 estimate and it is recommended that a 30% contingency be added to the estimate due to the project risks and the many variables that are expected before a final design is completed. The post-contingency cost estimate is \$13.4M.

As a reference, Contingency guidelines for Class 4 estimates are as follows:

AACE: 30% to 60%

EPRI: 30% to 50%

Please see Appendix B for the detailed estimate.

CONCLUSION

POWER performed a thorough review of the reports and material provided by GRE and MPUC. From a reliability perspective, the proposed Laketown 115 kV line configuration would lessen the likelihood of outages for local customers compared to Route Alternative B. In the future, Route Alternative B could require a costly new greenfield breaker substation to provide system load separation similar to the proposed route, nullifying any short-term cost savings from the shorter line. From a cost perspective, POWER determined that the transmission line and greenfield substation estimates provided by GRE were reasonable and align with POWER's own estimate assessments.

APPENDIX A

Transmission Line Estimate – Proposed Route (4.3 miles)

115kV Laketown Minnesota (MN) - 4.3mi Route A						
LINE LENGTH						
MN Miles=	4.3					
SD Miles=	0					
Total Miles=	4					
% MN Miles=	100%					
% SD Miles=	0%					
CONSTRUCTION TIMELINE						
Duration (months)=	4.5					
Assumed miles/month=	1					
OVERHEADS/RISK RESERVE						
Estimate total (NO OVERHEADS)=	\$ 10,869,210					
Risk Reserve (20%)=	\$ 2,173,842	Assuming 20%				
Escalation (2.5%)=	-					
[Contingency A]=	-					
[Contingency B]=	-					
[Contingency C]=	-					
Total Overheads=	\$ 13,043,052					
ESTIMATE TOTALS						
E&S (7.33%); Material P&W (1.98%); A&G (0.3%)=	-					
Total (w/out AFUDC)=	\$ 13,043,052					
AFUDC=	-					
Total (W/ AFUDC)=	\$ 13,043,052					
Contingency %=	16.67%					
Cost/Mile=	\$ 3,033,268					
PLAN = \$ 1,958,056						
INTERNAL LABOR (INLAB) Subtotal= \$ 29,460						
PERSONNEL		Total Cost	Total Hours			
CMT Sponsor	\$ -	0				
Facility ratings, SPE, DRM	\$ -	0				
PMO	\$ -	0				
External Legal	\$ -	0				
SURVEY		Total Cost	Miles	Cost/Mile		
Design Survey	\$ 14,730	4	\$ 1,100			
As-built Survey	\$ 14,730	4	\$ 1,100			
External Siting & Land Rights (EXSLR) Subtotal= \$ 1,613,696						
SITING & LAND RIGHTS/PERMITTING		Total Cost	Miles	Cost/Mile		
Environmental Survey/Permit Support	\$ -					
Acquisition	\$ 1,084,668					
Siting/Route Permit	\$ 515,528					
SWPPP	-					
Construction Access	-					
Construction Staking	-					
Downstream Environmental Permits	-					
Permit Compliance	-					
Regulatory Agency Review	-					
Public Outreach and Communications	-					
LAYDOWN YARDS/STORAGE SITES		Total Cost	# Yards	Months	Cost/Month	
Laydown Yard Rental	\$ 13,500	1	4.5	\$ 3,000		
External Engineering (EXENG) Subtotal= \$ 314,900						
ENGINEERING SUPPORT		Total Cost	Miles	Cost/Mile	Cost/Laydown Yd	Cost/Pull Pad
Contract Engineering	\$ 184,900	4	\$ 43,000			
Pipeline Studies						
SWPPP Development	\$ 30,000					
GEOTECH		Total Cost	Qty	Cost/Unit		
Soil Borings	\$ 100,000	20	\$ 5,000			
Concrete Testing						
NOTES						
Not including INLAB cost in estimate						
Includes \$10,000 mobilization cost-For entire line						
Includes \$10,000 mobilization cost-For entire line						
Assumed 52 acre total acquisition for T-line route						
Assumed acquisition cost from MISO estimate guide of \$14,247/acre + ROW cost of \$6.615/acre of crop land.						
Assumed permitting cost from MISO estimate guide of \$9.914/acre.						
Assumes 1 laydown yard						
NOTES						
Assuming \$43,000/mile based on similar past projects						
Assuming \$30,000 based on similar past projects.						
1 soil boring per RA and DE structure						
TBD						

Transmission Line Estimate – Route B (3.2 miles)

115kV Laketown Minnesota (MN) - 3.2mi Route B			
LINE LENGTH		STRUCTURE COUNTS	
MN Miles=	3.2	Tangents=	36
SD Miles=	0	Angles=	9
Total Miles=	3	Deadends=	5
% MN Miles=	100%		
% SD Miles=	0%		
CONSTRUCTION TIMELINE		Note: Route B T-Line estimate does not include any work for additional breaker	
Duration (months)=	3.25		0-2 DEG
Assumed miles/month=	1		2-60 DEG
OVERHEADS/RISK RESERVE			60-90 DEG
Estimate total (NO OVERHEADS)=	\$ 7,690,623		
Risk Reserve (20%)=	\$ 1,538,125	Assuming 20%	
Escalation (2.5%)=	-		
(Contingency A)=	-		
(Contingency B)=	-		
(Contingency C)=	-		
Total Overheads=	\$ 9,228,748		
ESTIMATE TOTALS			
E&S (7.33%), Material P&W (1.98%), A&G (0.3%)=			
Total (w/out AFUDC)=	\$ 9,228,748		
AFUDC=			
Total (w/ AFUDC)=	\$ 9,228,748		
Contingency %=	16.67%		
Cost/Miles=	\$ 2,883,984		

PLAN = \$ 1,474,537					
INTERNAL LABOR (INLAB) Subtotal=		\$ 27,040			
PERSONNEL	Total Cost	Total Hours			
CMT Sponsor	\$ -	0			
Facility ratings, SPE, DRM	\$ -	0			
PMO	\$ -	0			
External Legal	\$ -	0			
SURVEY	Total Cost	Miles	Cost/Mile		
Design Survey	\$ 13,520	3	\$ 1,100		
As-built Survey	\$ 13,520	3	\$ 1,100		
External Siting & Land Rights (EXSLR) Subtotal=	\$ 1,209,897				
SITING & LAND RIGHTS/PERMITTING	Total Cost	Miles	Cost/Mile		
Environmental Survey/Permit Support	\$ -				
Acquisition	\$ 813,501				
String/Route Permit	\$ 386,646				
SWPPP	-				
Construction Access	-				
Construction Staking	-				
Downstream Environmental Permits	-				
Permit Compliance	-				
Regulatory Agency Review	-				
Public Outreach and Communications	-				
LAYDOWN YARDS/STORAGE SITES	Total Cost	# Yards	Months	Cost/Month	
Laydown Yard Rental	\$ 9,750	1	3.25	\$ 3,000	
External Engineering (EXENG) Subtotal=	\$ 237,600				
ENGINEERING SUPPORT	Total Cost	Miles	Cost/Mile	Cost/Laydown Yd	Cost/Pull Pad
Contract Engineering	\$ 137,600	3	\$ 43,000		
Pipeline Studies					
SWPPP Development	\$ 30,000				
GEOTECH	Total Cost	Qty	Cost/Unit		
Soil Borings	\$ 70,000	14	\$ 5,000		
Concrete Testing					

NOTES
Not including INLAB cost in estimate
Includes \$10,000 mobilization cost-For entire line
Includes \$10,000 mobilization cost-For entire line
Assumed 39 acre total acquisition for T-line route
Assumed acquisition cost from MISO estimate guide of \$14,247/acre + ROW cost of \$8,615/acre of crop land.
Assumed permitting cost from MISO estimate guide of \$9,914/acre.
Assumes 1 laydown yard
NOTES
Assuming \$43,000/mile based on similar past projects
Assuming \$30,000 based on similar past projects.
1 soil boring per RA and DE structure
TBO

APPENDIX B

Please see attached 25-0151-19412_GRE_Alt-B_Greenfield_Breaker_Station_Estimate.pdf

ASSUMPTIONS & BASIS OF ESTIMATE



**PROJECT: Great River Energy
Alt B Greenfield Breaker Station**

PROJECT DESCRIPTION / SCOPE

New greenfield 115 kV three breaker ring expandable to breaker-and-a-half to facilitate transmission line "Alternate B" to the new Laketown distribution substation.

DOCUMENTS

DOC./DWG NO.	TITLE	REV NO.	DATE
ET-2/TL-24-132	MPUC Written Order		10/2/2025
ET-2/TL-24-132	Supplemental Information Request Response		10/9/2025
	Sketch		
	GRE 115kV Standard Layouts		

ASSUMPTIONS, EXCEPTIONS, RISKS AND CLARIFICATIONS

1. This estimate does not include any transmission line work outside the station fence.
2. Any associated remote end terminal work is not included except for end-to-end testing.
3. BPS type Security System with Card readers, cameras, intrusion, etc. is not included.
4. AC Station Service assumed to be from a 66.4kV SSVT with a backup from the local distribution line.
5. Telecom assumed to be on the line OPGW with no backup since it will be in three directions.

SITE DEVELOPMENT AND GRADING

The following quantities are assumed for site grading:

Clearing	2 acres
Grubbing	3,000 CY
Cut	4,000 CY
Fill	4,000 CY
Excavate unsuitable soils	6,000 CY
Import Fill	9,000 CY
6" - 8" Rip Rap on Slopes	600 CY

Ground grid was assumed to be installed with average spacing of 20 feet.

ESTIMATE ACCURACY

These are Conceptual Estimates (Class A) with an RSP Listing Target Accuracy of -25% to +50%. This is derived from ACEC recommended practice 17R-97-2003 (Class 4) and EPRI Technology Assessment Guide 1993 and customized for transmission projects.

ASSUMPTIONS & BASIS OF ESTIMATE



**PROJECT: Great River Energy
Alt B Greenfield Breaker Station**

CONTINGENCY ADDERS

The projects have not been defined specifically enough to develop risk registers with heat maps to establish acceptable contingency calculations so a 30% Contingency has been added to each project estimate to cover the most common risks associated with substation construction projects in the region.

As a reference, Contingency guidelines for Class A (AACE Class 4) estimates are as follows:

AACE: 30% to 60%

EPRI: 30% to 50%

AFUDC & ESCALATION

No AFUDC has been added to the estimates.

No Escalation has been applied to the estimates.

BONDS

Contractor Payment and Performance Bonds have been calculated at 1% of the estimated construction contractor's contract amount and added to the Mobilization cost for each project since bonds must be posted prior to Notice to Proceed (activity place holder for future cash flow calculations if required).

LABOR RATE USED IN ESTIMATE

Labor rate based on working 6-10's schedule derived from rates and conditions stipulated in the Labor Agreement between IBEW Local Union 160 and NECA. Loaded Labor Rate includes wages and benefits, taxes, workers compensation insurance, typical construction equipment, tools, consumables, material handling, supervision, quality control and contractor overhead and profit.

Loaded rate used based on typical substation crew and equipment spread is \$240/direct manhour

FOUNDATIONS

Typical foundations were assumed and include excavation, compaction, forming, supply and placement of rebar, supply and placement of concrete including hydraulic vibration, install and secure anchor bolts with surveyed precision, concrete on-site testing including slump, air content, density and the collection of molding strength specimens (cylinders)

Total concrete foundations cost was estimated to be an average of \$1800/CY

Total concrete volume required is estimated to be 240 Cubic Yards

Excessive rock excavation or dewatering was not included in the foundations estimate.

Supply of anchor bolts was not included in the foundations cost as they are assumed included in the supply of the steel structures.

ASSUMPTIONS & BASIS OF ESTIMATE



**PROJECT: Great River Energy
Alt B Greenfield Breaker Station**

STEEL STRUCTURES

It was assumed that supply of the galvanized steel structures would include an early delivery of the anchor bolts to the site followed later by the structures themselves delivered by road transport. Average cost of steel structures FOB site is assumed to be \$3.6/lb

Total steel quantity for this project is estimated to be approximately 149,710 pounds.

UTILITY INTERNAL COSTS

Utility Internal Costs for direct labor, indirect labor and capital projects allocations are assumed to add 5% to the project costs.

REAL ESTATE COSTS

Cost of Real Estate estimated from current listings for land at realtor.com.

ENVIRONMENTAL

Cost of site specific environmental requirements and permits estimated from experience on previous similar projects in the region.

SALES TAX

State sales tax is not included in the estimate.

Great River Energy
Alt B Greenfield Breaker Station

CONCEPTUAL ESTIMATE



DESCRIPTION	LABOR	MATERIAL	L & M
ESTIMATED COST SUMMARY			
EQUIPMENT (outdoor)	420,000	789,000	1,209,000
STRUCTURES	304,000	561,000	865,000
FOUNDATIONS	363,000	91,000	454,000
CABLE & CONDUIT	397,000	107,000	504,000
CONTROL ENCLOSURE	318,000	892,000	1,210,000
SITE IMPROVEMENTS	1,481,000	506,000	1,987,000
REMOVALS	-	-	-
TESTING & ENERGIZATION	307,000	-	307,000
SUBTOTAL	3,590,000	2,946,000	6,536,000
CONTRACTOR MOB/DEMOB			130,000
CONSTRUCTION MANAGEMENT			386,000
ENGINEERING			654,000
ENVIRONMENTAL & PERMITTING			200,000
REAL ESTATE COSTS			2,000,000
UTILITY INTERNAL COSTS (5%)			386,000
SALES TAX (0%)			-
AFUDC - CALCULATED IN CASH FLOW			-
SUBTOTAL			10,292,000
CONTINGENCY (30%)			3,088,000
ESCALATION			-
TOTAL ESTIMATED COST			13,380,000

Note: Rows with zero value are deliberately shown to demonstrate that they are excluded.



Great River Energy

Alt B Greenfield Breaker Station

DESCRIPTION	AMOUNT		LABOR	MATERIAL	L & M	
	QTY	UNIT	UNIT	UNIT	UNIT	EXTEND
EQUIPMENT (outdoor)						
115kV Circuit Breaker, 3000A, 50kA	3	ea	9,600	130,000	139,600	418,800
115kV Disconnect Switch, 3000A	9	ea	8,640	19,000	27,640	248,760
115kV Grounding Blades, 63kA	3	ea	3,840	4,600	8,440	25,320
115kV Station Class, MCOV Surge Arrester	9	ea	1,440	2,400	3,840	34,560
115kV CCVT	9	ea	1,440	8,400	9,840	88,560
115kV Station Service VT 50kVA	1	ea	5,760	45,000	50,760	50,760
115kV Insulators	40	ea	960	250	1,210	48,400
25kV Station Service Transformer, 50kVA	1	ea	2,400	4,100	6,500	6,500
Outdoor Lights, 400W HPS or LED=	12	ea	960	300	1,260	15,120
Nameplates	22	ea	120	15	135	2,970
Equipment Above Grade Grounding	1	lot	25,344	2,904	28,248	28,248
Misc. Bus, Fittings & Jumpers	1	lot	189,360	50,302	239,662	239,662
Total						1,207,660
STRUCTURES						
115kV A-Frame	3	ea	31,200	93,600	124,800	374,400
115kV High Bus Switch Stand	3	ea	4,800	9,360	14,160	42,480
115kV Low Bus Switch Stand	12	ea	4,320	8,640	12,960	155,520
115kV High Bus Support, Three Phase	4	ea	2,880	5,400	8,280	33,120
115kV Low Bus Support, Three Phase	8	ea	2,160	4,320	6,480	51,840
115kV Low Bus Support, Single Phase	4	ea	1,440	2,520	3,960	15,840
115kV Surge Arrestor Stand	9	ea	1,440	2,520	3,960	35,640
115kV Instrument Transformer Stand	10	ea	1,440	2,520	3,960	39,600
Static Wire Mast	2	ea	5,520	10,800	16,320	32,640
Structures Above Grade Grounding	1	Lot	70,560	12,494	83,054	83,054
Total						864,134
FOUNDATIONS						
115kV Circuit Breaker	3	ea	3,840	960	4,800	14,400
115kV High Bus Switch Stand	3	ea	5,280	1,320	6,600	19,800
115kV Low Bus Switch Stand	12	ea	4,800	1,200	6,000	72,000
115kV Surge Arrestor Stand	9	ea	2,240	560	2,800	25,200
115kV Instrument Transformer Stand	10	ea	2,160	540	2,700	27,000
115kV High Bus Support, Three Phase	4	ea	4,320	1,080	5,400	21,600
115kV Low Bus Support, Three Phase	8	ea	2,700	675	3,375	27,000
115kV Low Bus Support, Single Phase	4	ea	1,800	450	2,250	9,000
115kV A-Frame	3	ea	32,640	8,160	40,800	122,400
Control Enclosure	1	ea	69,120	17,280	86,400	86,400
Station Service Transformer	1	ea	1,440	360	1,800	1,800
Static Wire Mast	2	ea	10,800	2,700	13,500	27,000



Great River Energy
Alt B Greenfield Breaker Station

DESCRIPTION	AMOUNT		LABOR	MATERIAL	L & M	
	QTY	UNIT	UNIT	UNIT	UNIT	EXTEND
Total						453,600
CABLE & CONDUIT						
25 kV Cable, 2/0 Al	1,500	ft	4.80	5.00	9.80	14,700
25 kV, 2/0 Termination	2	ea	720.00	290.00	1,010.00	2,020
Cable Trench, Trenwa 30" Wide	150	ft	72.00	205.00	277.00	41,550
Trench & Backfill for Conduits	3,800	ft	24.00	-	24.00	91,200
Underground PVC Conduit, 3" for Control	300	ft	9.60	10.00	19.60	5,880
Underground PVC Conduit, 2" for Control & Lgts	900	ft	7.20	5.00	12.20	10,980
Fiber Optic Cable & Terminations	1	lot	24,000	5,000	29,000	29,000
Control Cable Installation	1	lot	83,760	36,954	120,714	120,714
Control Cable Terminations	1	lot	38,640	277	38,917	38,917
Testing and Energization Support	1	lot	50,400	-	50,400	50,400
Power Cable - Station Service	1	lot	38,400	12,000	50,400	50,400
Above Ground Raceways - GRS & J-Boxes	1	lot	41,040	6,391	47,431	47,431
Total						503,192
CONTROL ENCLOSURE						
AC/DC Panels	8	ea	3,840	3,500	7,340	58,720
Battery System, 400 Ahr	1	lot	38,400	31,000	69,400	69,400
Control Enclosure 36' x 24'	1	ea	9,600	302,400	312,000	312,000
Cable Tray	120	ft	48	15	63	7,560
Conduits, Outlets, and Lights	1	lot	14,400	4,000	18,400	18,400
Control Panel - Transmission Line	3	ea	9,600	78,000	87,600	262,800
Control Panel - Breaker Control	3	ea	9,600	42,000	51,600	154,800
Control Panel - Bus Differential	2	ea	9,600	35,000	44,600	89,200
SCADA, Comms, Annun, Metering Panel	5	ea	9,600	18,000	27,600	138,000
Interpanel wiring	1	lot	93,600	3,900	97,500	97,500
Total						1,208,380
SITE IMPROVEMENTS						
Site Survey	1	lot	14,400	1,000	15,400	15,400
Site Geotech	1	lot	9,600	11,200	20,800	20,800
Access Road, 20' wide	200	ft	96	15	111	22,200
Site Development and Grading	1	lot	1,065,600	354,000	1,419,600	1,419,600
Grounding, Below Grade	1	lot	247,920	48,378	296,298	296,298
Fence Grounding, Above Grade	1	lot	6,720	840	7,560	7,560
Fence, 7' w/ 1' Barbed Wire	1,120	ft	36.00	40.00	76.00	85,120
Fence Gate - 20'	2	ea	7,200	1,200	8,400	16,800
Finish Surfacing, 4" Crushed Rock	957	CY	64.80	42.00	106.80	102,208
Total						1,985,986



Great River Energy
Alt B Greenfield Breaker Station

DESCRIPTION	AMOUNT		LABOR	MATERIAL	L & M	
	QTY	UNIT	UNIT	UNIT	UNIT	EXTEND
REMOVALS						
Total						-
TESTING & ENERGIZATION						
Physical Checkout	1	lot	8,784	-	8,784	8,784
Wiring Check	1	lot	17,568	-	17,568	17,568
Circuit Breaker	3	ea	14,640	-	14,640	43,920
Control/Meter Panel	13	ea	14,640	-	14,640	190,320
Grounding	1	lot	7,320	-	7,320	7,320
Current Transformers	36	ea	366	-	366	13,176
Potential Transformers	9	ea	732	-	732	6,588
Battery System	1	ea	4,392	-	4,392	4,392
Mob/Demob & Equip	1	lot	14,640	-	14,640	14,640
Total						306,708