



Proposed Facility Study Report

Project:

A380_A383_A415_A414_A413

MISO # F088

Prepared for Midwest ISO

January 15th, 2010

Great River Energy

Contact:
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Great River Energy

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1. Overview of the Project

This project consists of upgrades to the Great River Energy (GRE) (the Transmission Owner) owned Coal Creek and Stanton Substation 230kV SV line termination.

Great River Energy is defined as the Transmission Owner and Balancing Authority for the purpose of this report.

i. Facility Study Summary

In accordance with the Interconnection Facility Study Proposal submitted to Midwest Independent System Operator (MISO) by the Transmission Owner, Great River Energy has provided an estimate for the performance of an Interconnection Facility Study (FS) for the Transmission Service Request designated F088. This FS report is based on the request by MISO and the Customer with a selected option of a +/-20% estimate within 90 days from receipt of purchase order and signed Scope of Authorization. This FS report is being prepared and submitted to MISO.

This FS report documents the required facility upgrades to the Transmission Owner's substation and transmission line facilities required to connect the Customer's generation facilities as identified in project F088.

The network upgrades include stand alone upgrades and non-stand alone upgrades. The stand alone upgrades are those that can be constructed or installed with no interface to the Owner's existing facilities. There are no stand alone network upgrades associated with F088. Non-stand alone network upgrades are those that require interface with the Owner in order to proceed with the installation. All required upgrades due to the addition of F088 are non-stand alone network upgrades.

The interconnection facilities are upgrades that will be 100% funded by the Interconnection Customer and will be designed, procured, constructed and owned by the Transmission Owner at the point of interconnection on the Transmission Owner's Facility. There are no interconnection facilities for GRE for this project.

Customer owned facilities are not detailed in this report.

2. System Upgrades

i. Stand Alone System Upgrade

There are no stand alone system upgrades.

ii. Non-Stand Alone System Upgrades

a. Stanton Substation

Project Location:

This project is located at the Stanton Substation which is located in Government Lot 6 in Section 16, Township 144, Range 84, Mercer County, North Dakota

Project Overview:

The Scope of work for this portion of the project includes improvements to the Transmission Owner Stanton Substation owned by Great River Energy in order to accommodate the increased capacity of the 230kV SV line to a winter rating of 525.5 MVA. The Transmission Owner non-stand alone network upgrades are defined as all facilities and equipment owned by the Transmission Owner, in this case Great River Energy, any modifications, additions or upgrades due to F088.

Non-stand alone network upgrades covered in this study include the replacement of six 230kV disconnect switches, a wave trap and all bus jumpers within the Coal Creek – McHenry 230kV SV line termination breaker row.

Outages at Stanton substation will be required in phases to complete the substation work. An outage on the 230kV SHN line to Square Butte within the breaker row that includes the 230kV SV line to Coal Creek will require a 75MW Stanton Plant reduction. It may also require at Minnkota a 75MW Young Plant reduction. Spring and fall outages would be the best time to do this work and the best case would be during a scheduled unit outage at the Stanton substation. The additional cost for these plant reductions is not included in the cost estimates but will need to be considered in actual costs based on the timeframe of the outage needed.

Design Criteria:

Transmission Owner (GRE) Standard Substation Design Criteria will be applicable. Where no applicable standards are available, the Transmission Owner and Substation Owner will substitute industry standards and other good utility practices.

Insulation Coordination:

Normal Operating Voltage (phase to phase): 230 kV

Basic Impulse Level: 900 kV

Bus Fault Levels (Maximum):

Three-phase: 19,340 amperes

Single-phase: 17,737 amperes

MAJOR ITEMS:

Equipment and materials:

- New Electrical Equipment: 230kV
 - Six three phase 230kV, 2000Amp disconnect switches with motor operators.
 - One single phase 230kV, 2000Amp Wave Trap.
- Bus Conductor:
 - 750 feet of 2-1590 MCM AAC for breaker jumpers.
 - 350 feet of 2-1590 MCM AAC for line jumpers.
 - 300 feet of 2-1590 MCM AAC for strain bus to al. bus jumpers.
- Cables, Control:
 - Control cable will be installed per the Substation Owner's standards.
- Bus Connectors:
 - Welded aluminum type connectors will be used for flexible type bus connections.
 - Welded aluminum fittings will be used for ridged type bus connections.
- Ground Conductor Connections:
 - New ground connections will be used. The below grade ground wire connections shall be exothermic weld type Cadweld or equivalent. Above ground connections shall be bolted type or compression type per Great River Energy Standard Substation design

Miscellaneous systems upgrade requirements:

Station AC Auxiliary service: The existing AC station aux service is large enough to accommodate the additional loads associated with the substation modifications. The station Aux system does not require any additional AC distribution panels to accommodate the changes to Stanton.

Station DC System: The Station DC battery system will sufficiently support the Stanton Substation modifications as described in this report. No additional DC panels are required to accommodate the additional DC Circuits associated with the substation modifications.

b. Coal Creek Substation

Project Location:

This project is located at the Coal Creek Substation in the SW ¼ of Section 17, Township 145, Range 82, McLean County, North Dakota.

Project Overview:

The Scope of work for this portion of the project includes improvements to the Transmission Owner Coal Creek Substation owned by Great River Energy in order to accommodate increased capacity of the 230kV SV line to a winter rating of 525.5 MVA. The Transmission Owner non-stand alone network upgrades are defined as all facilities and equipment owned by the Transmission Owner, in this case Great River Energy, any modifications, additions or upgrades due to F088.

Non-stand alone network upgrades covered in this study include all bus jumpers within the 230kV Stanton – McHenry 230kV SV line termination breaker row.

Outages at Coal Creek substation will be required in phases to complete the substation work. An outage to the bus section connected to Filter Bank #3 may require plant reductions on unit #1 and unit #2. Spring and fall outages would be the best time to do this work and the best case would be during scheduled unit outages at the Coal Creek Substation. The additional cost for these plant reductions is not included in the cost estimate but will need to be considered for actual costs based on the timeframe of the outage needed.

Design Criteria:

Transmission Owner (GRE) Standard Substation Design Criteria will be applicable. Where no applicable standards are available, the Transmission Owner and Substation Owner will substitute industry standards and other good utility practices.

Insulation Coordination:

Normal Operating Voltage (phase to phase): 230 kV

Basic Impulse Level: 900 kV

Bus Fault Levels (Maximum):

Three-phase: 20,043 amperes

Single-phase: 23,935 amperes

MAJOR ITEMS:

Equipment and materials:

- Bus Conductor:
 - 750 feet of 2-1590 MCM AAC for breaker jumpers.
 - 350 feet of 2-1590 MCM AAC for switches to strain bus and line jumpers.
 - 150 feet of 2-1590 MCM AAC for strain bus to al. bus jumpers.

- Bus Connectors:
 - Welded aluminum type connectors will be used for flexible type bus connections.
 - Welded aluminum fittings will be used for ridged type bus connections.
- Ground Conductor Connections:
 - New ground connections will be used. The below grade ground wire connections shall be exothermic weld type Cadweld or equivalent. Above ground connections shall be bolted type or compression type per Great River Energy Standard Substation design

Miscellaneous systems upgrade requirements:

Station AC Auxiliary service: The existing AC station aux service is adequate. The required upgrades will not impact the station AC.

Station DC System: The Station DC battery system is adequate. The required upgrades will not impact the DC system.

iii. Interconnection Facilities

a. None.

3. Right of Way Requirements (Not applicable to this study)

4. Exhibits

Following Exhibits attached to this report.

A1. Customer One-Line and Site Map

N/A

A2. Transmission Owner One-Lines

A3. Site Plans

A4. Transmission Line Plan and Profile

N/A

A5. Facilities to be constructed by Transmission Owner

A6. Detailed Cost of Facilities to be constructed by Transmission Owner

A7. Facilities to be constructed by Customer

N/A

A8. Detailed Cost of Facilities to be constructed by Customer

N/A

A9. Facilities subject to Transmission Owner reimbursement

A10. Contingent Facilities

N/A

A11. Customer Milestones

A12. Construction and Coordination Schedules

A13. Permits, Licenses, Regulatory Approvals and Authorization

N/A

A14. Interconnection and Operating Guidelines

N/A

Exhibit A1

Customer One-line

N/A

Exhibit A2-1

Transmission Owner One-Line

Stanton Substation

Exhibit A2-2

Transmission Owner One-Line

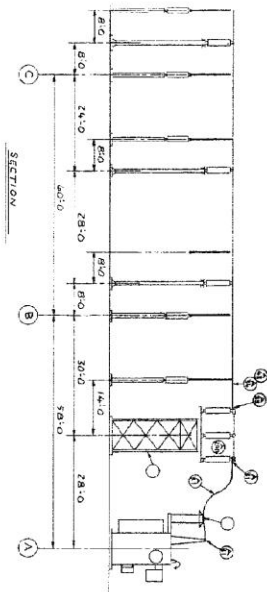
Coal Creek Substation

Exhibit A3-1

Stanton Substation - General Arrangement

Exhibit A3-2

Stanton Substation – Sectional View



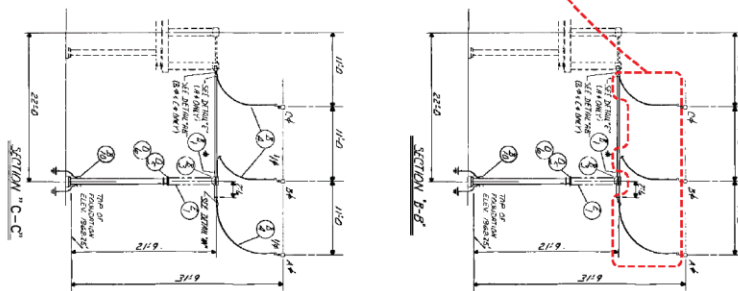
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Exhibit A3-3

Coal Creek – General Arrangement

Exhibit A3-4

Coal Creek - Sectional View



NOTE:
1. FOR CONDUCTIVE CONNECTION IN THIS, SEE DING 364-047, 30 34 2
2. FOR EQUIPMENT AND STRUCTURE GOVERNING DETAILS SEE DING 364-076, 30 5

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Exhibit A3-5

Coal Creek - Sectional View

Exhibit A3-6

Coal Creek - Sectional View

Exhibit A3-7

Coal Creek - Sectional View

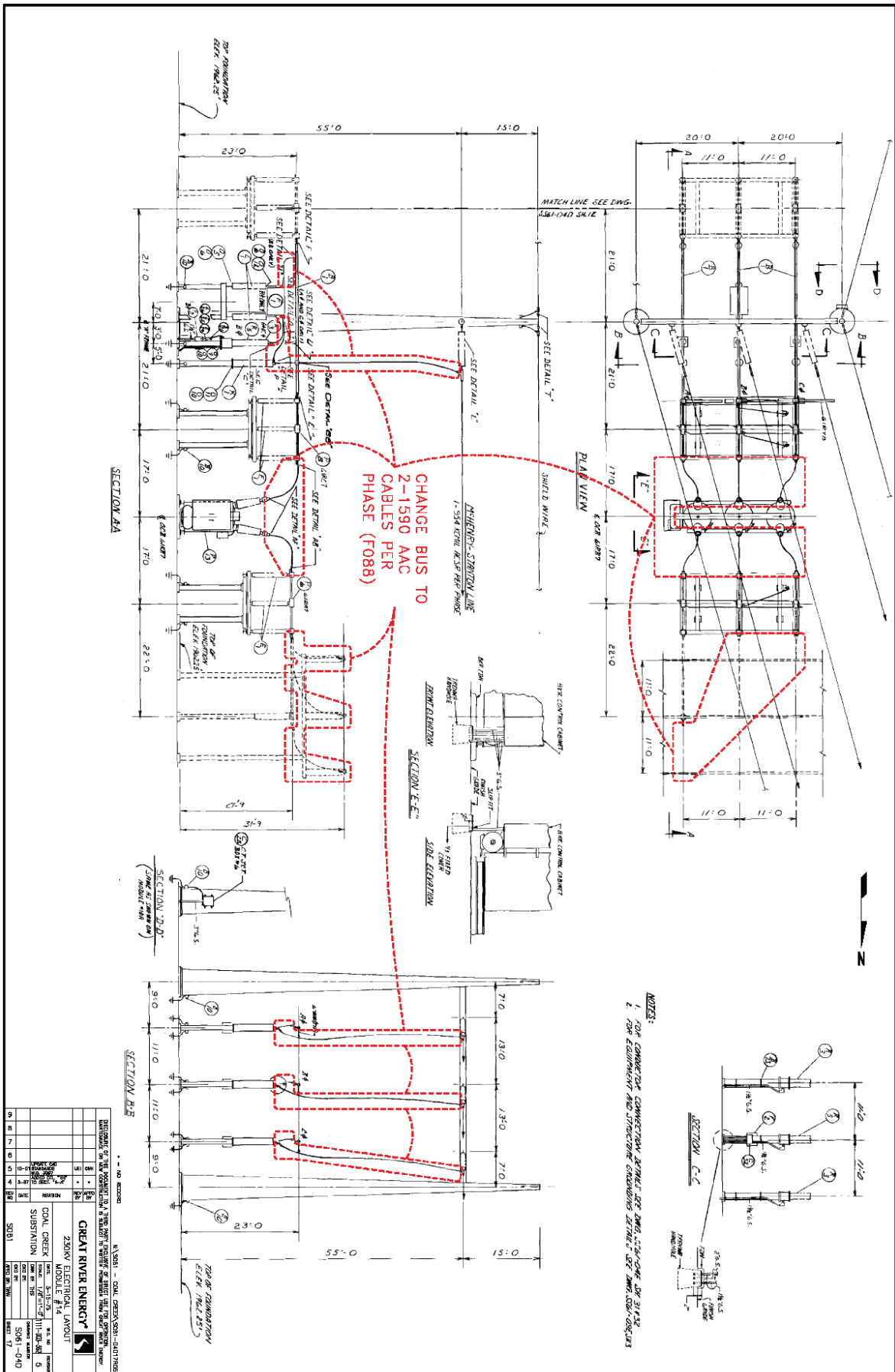


Exhibit A4

Transmission Line Plan & Profile

N/A

Exhibit A5

Facilities to be constructed by Transmission Owner (GRE)

	Location	Facilities to be Constructed by Transmission Owner	Estimate in 2010 dollars
1	Stand Alone Network Upgrades	None addressed under the Scope of Work for this Study	NA
2	Non-Stand Alone Network Upgrades	Item #1 - Stanton Substation Upgrades	\$423,417*
3	Non-Stand Alone Network Upgrades	Item #2 – Coal Creek Substation Upgrades	\$88,021**
4	Interconnection Facilities	None addressed under the Scope of Work for this Study	NA

* - Outages at Stanton substation will be required in phases to complete the substation work. An outage on the 230kV SHN line to Square Butte within the breaker row that includes the 230kV SV line to Coal Creek will require a 75MW Stanton Plant reduction. It may also require a Minnkota a 75MW Young Plant reduction. Spring and fall outages would be the best time to do this work and the best case would be during a scheduled unit outage at the Stanton substation. The additional cost for these plant reductions is not included in the cost estimate but will need to be considered for actual costs based on the timeframe of the outage needed.

** - Outages at Coal Creek substation will be required in phases to complete the substation work. An outage to the bus section connected to Filter Bank #3 may require plant reductions on unit #1 and unit #2. Spring and fall outages would be the best time to do this work and the best case would be during a scheduled unit outages at the Coal Creek Substation. The additional cost for these plant reductions is not included in the cost estimate but will need to be considered for actual costs based on the timeframe of the outage needed.

Exhibit A6-1
Detailed Cost of Stanton Substation Network Upgrades to be constructed by
Transmission Owner

Project Summary

Project Title: F088 Facility Study

Project Location: Stanton Substation

Project Option: A

Revision: 1

Project Number: 83251

PM Name: Greg Schutte

Status: In Progress

Retained Date:

Transmission Division Depts - Internal Labor and Expenses	\$22,409
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	Misc Expenses	Hours	Labor Cost	Total
Engineering	\$0	586	\$21,104	\$21,104
Project Management	\$0	30	\$1,305	\$1,305
Telecommunications	\$0	0	\$0	\$0
System Operations	\$0	0	\$0	\$0
Planning	\$0	0	\$0	\$0
Surveying	\$0	0	\$0	\$0
Land Rights	\$0	0	\$0	\$0
Environmental	\$0	0	\$0	\$0

Construction Labor	\$61,425
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Lineman	\$0	1235	\$46,312	\$46,312
Apparatus	\$0	36	\$1,350	\$1,350
Relay	\$0	239	\$8,963	\$8,963
Telecommunications	\$0	6	\$225	\$225
Field Services	\$0	6	\$225	\$225
Outside Contractors	\$0	0	\$0	\$0
Construction and Maintenance	\$0	100	\$4,350	\$4,350

Materials	\$170,848
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Cable Trench & Conduit	\$324
Deadend Guy & Shield	\$1,500
Electrical Equipment - Buswork	\$30,030
Electrical Equipment - Cables	\$7,634
Electrical Equipment - Major Physical	\$129,500
Grounding	\$1,860

Land Rights	\$0
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Land Rights Damage Payments	\$0
Land Rights Easement Payments	\$0

Project Summary

Project Title: F088 Facility Study
Project Location: Stanton Substation
Project Option: A

Revision: 1

Project Number: 83251
PM Name: Greg Schutte
Status: In Progress
Retained Date:

Land Rights Legal Fees	\$0
Land Rights Misc	\$0

Environmental	\$0
Environmental Crossing Permits	\$0
Environmental Legal Fees	\$0
Environmental Upfront Permits	\$0

Subtotal	\$254,682
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Overhead Costs	\$168,735
9999 Allocation	\$17,605
General Administration	\$63,572
Heavy Equipment	\$5,550
Interest	\$8,544
Payroll Burden	\$57,013
Stores Expense	\$6,289
Vehicle Allocation	\$10,162

Reimbursable	\$0
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Total	\$423,417
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Detail - Materials

Project Title: F088 Facility Study
 Project Location: Stanton Substation
 Project Option: A

Revision: 1

Project Number: 83251
 PM Name: Greg Schutte
 Status: In Progress
 Retained Date:

Materials Total Cost	\$176,398
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<u>Material Type</u>	<u>Description</u>	<u>Qty</u>	<u>Cost</u>
Install			
Cable Trench & Conduit	Trenching and Access - Hand (24" wide X 24" dee	450	\$324
Construction Heavy Equipment	Equip - Bobcat	2	\$1,500
	Equip - JLG- 60 ft.'	3	\$4,050
Deadend Guy & Shield	Transmission Line Tee Tap	3	\$1,500
Electrical Equipment - Buswork	Conductor- 1590 All Aluminum 61 strand	1400	\$7,630
	Conductor Fittings - Term.,Coupler, Damper, End	1400	\$14,000
	Contract Welding	60	\$8,400
Electrical Equipment - Cables	CABLE - 3/C #10, Type Non-shielded	2200	\$3,300
	CABLE - 3/C #8, Type Non-shielded	2200	\$4,334
Electrical Equipment - Major Physical	SW - 230kV 3PST 2000A VB w/ motor operator	6	\$114,000
	Wave (Line) Trap 2000A	1	\$15,500
Grounding	Ground - Cadweld Connections	5000	\$250
	Ground - 4/0 Cu wire 19 strand	100	\$310
	Ground - Mobilization	1	\$1,300

Exhibit A6-2
Detailed Cost of Coal Creek Substation Upgrades to be constructed by
Transmission Owner

Project Summary

Project Title: F088 Facility Study
Project Location: Coal Creek Substation
Project Option: B

Revision: 1

Project Number: 83251
PM Name: Greg Schutte
Status: In Progress
Retained Date:

Transmission Division Depts - Internal Labor and Expenses				\$6,570
	Misc Expenses	Hours	Labor Cost	Total
Engineering	\$0	153	\$5,265	\$5,265
Project Management	\$0	20	\$870	\$870
Telecommunications	\$0	0	\$0	\$0
System Operations	\$0	10	\$435	\$435
Planning	\$0	0	\$0	\$0
Surveying	\$0	0	\$0	\$0
Land Rights	\$0	0	\$0	\$0
Environmental	\$0	0	\$0	\$0
Construction Labor				\$11,153
Lineman	\$0	245	\$9,188	\$9,188
Telecommunications	\$0	0	\$0	\$0
Outside Contractors	\$0	0	\$0	\$0
Construction and Maintenance	\$0	46	\$1,965	\$1,965
Materials				\$34,212
Contingency				\$5,000
Electrical Equipment - Buswork				\$27,712
Misc				\$1,500

Land Rights	\$0
Land Rights Damage Payments	\$0
Land Rights Easement Payments	\$0
Land Rights Legal Fees	\$0
Land Rights Misc	\$0
Environmental	\$0
Environmental Crossing Permits	\$0

Project Summary

Project Title: F088 Facility Study
Project Location: Coal Creek Substation
Project Option: B

Revision: 1

Project Number: 83251
PM Name: Greg Schutte
Status: In Progress
Retained Date:

Environmental Legal Fees	\$0
Environmental Upfront Permits	\$0

Subtotal	\$51,935
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Overhead Costs	\$36,086
9999 Allocation	\$3,722
General Administration	\$13,440
Heavy Equipment	\$0
Interest	\$1,776
Payroll Burden	\$12,053
Stores Expense	\$3,171
Vehicle Allocation	\$1,924

Reimbursable	\$0
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Total	\$88,021
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Detail - Materials

Project Title: F088 Facility Study
Project Location: Coal Creek Substation
Project Option: B

Revision: 1

Project Number: 83251
PM Name: Greg Schutte
Status: In Progress
Retained Date:

Materials Total Cost	\$34,212
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<u>Material Type</u>	<u>Description</u>	<u>Qty</u>	<u>Cost</u>
Install			
Contingency	Contingency	1	\$5,000
Electrical Equipment - Buswork	Conductor- 1590 All Aluminum 61 strand	1250	\$6,812
	Conductor Fittings - Term.,Coupler, Damper, End	1250	\$12,500
	Contract Welding	60	\$8,400
Misc	Transmission Line Tee Tap	3	\$1,500

Exhibit A6-3
Detailed Cost of Interconnection Facilities to be constructed by Transmission
Owner
N/A

Exhibit A7

Facilities to be constructed by Customer

Facilities constructed by the Customer are not included in this Study.

Exhibit A8

Detailed Cost of Facilities to be constructed by Customer

There are no facilities to be constructed by the Customer that are covered by the scope of this study.

Exhibit A9

Facilities Subject to Transmission Owner reimbursement

	Location	Facilities to be Constructed by Transmission Owner	Estimate in 2010 dollars
1	Stand Alone Network Upgrades	None addressed under the Scope of Work for this Study	NA
2	Non-Stand Alone Network Upgrades	Item #1 - Stanton Substation Upgrades	\$423,417*
3	Non-Stand Alone Network Upgrades	Item #2 – Coal Creek Substation Upgrades	\$88,021**
4	Interconnection Facilities	None addressed under the Scope of Work for this Study	NA

* - Outages at Stanton substation will be required in phases to complete the substation work. An outage on the 230kV SHN line to Square Butte within the breaker row that includes the 230kV SV line to Coal Creek will require a 75MW Stanton Plant reduction. It may also require a Minnkota a 75MW Young Plant reduction. Spring and fall outages would be the best time to do this work and the best case would be during a scheduled unit outage at the Stanton substation. The additional cost for these plant reductions is not included in the cost estimate but will need to be considered for actual costs based on the timeframe of the outage needed.

** - Outages at Coal Creek substation will be required in phases to complete the substation work. An outage to the bus section connected to Filter Bank #3 may require plant reductions on unit #1 and unit #2. Spring and fall outages would be the best time to do this work and the best case would be during a scheduled unit outages at the Coal Creek Substation. The additional cost for these plant reductions is not included in the cost estimate but will need to be considered for actual costs based on the timeframe of the outage needed.

Exhibit A10

Contingent Facilities

There are no contingency facilities addressed in this study.

Exhibit A11

Customer Milestones

MISO communicated the following milestone dates for the F088 schedule.

- The in-service date for the new 500kV Transmission is June 1st, 2017.

Note:

1. The Transmission Owner proposed schedule dates may not match or align with the customer requested in-service date.

Exhibit A12

Construction & Coordination Schedules

The project schedule is prepared based on the normal activities and time frame required by the Transmission Owner. It may not match with the Customer requirements and in-service dates. At the time of executing the Interconnection Agreement a project schedule will be developed that will integrate with other work/projects performed by the Transmission Owner.

Below is a project schedule for the Transmission Owner Facilities.

Milestone Description	Timeline
Engineering and design	May 2016
Permitting	N/A
Order Long Lead Material	August 2016
Construction of Network Upgrades	February 15 th , 2017- June 1 st , 2017
Place Network Upgrades In-service	By June 1 st , 2017

Note:

1. The Transmission Owner proposed schedule dates may not match or align with the customer requested in-service date. The dates are also dependent on a signed Interconnection Agreement with the customer meeting the milestones as set forth in the Interconnection Agreement. Transmission Owner schedule dates also depend on the ability to take out the following GRE equipment 230kV SV transmission line, portions of the Stanton Substation, and portions of the Coal Creek Substation for construction during the fall or spring months.

Exhibit A13

Permits, Licenses, Regulatory Approvals and Authorization

Permits for the proposed Stanton and Coal Creek modifications are not expected to be required.

Exhibit A14

Interconnection and Operating Guidelines

N/A