

FINAL
FACILITIES STUDY

Transmission Requests 70306269, 70306271 &
70306272

October 2007

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[Revised 3 Apr 08, for public posting]



Draft Facility Study – Basin Electric Power Cooperative (70306272, 70306271, 70306269)

A. DESCRIPTION

1. Background of Request

On December 3, 2004, 70306269,70306271,70306272 (Customer) made three separate requests for Firm Point-to-Point Transmission service in the Transmission Queue managed by Western Area Power Administration (Western) from the Dave Johnston 230-kV bus to the Ault 345-kV bus for a total capacity reservation of 300 MW. On July 17, 2006, the customer completed the System Impact Study titled “Eastern Wyoming Joint Queue Study TOT3 WECC Phase Two Study.”

The customer has requested that Western perform a Facility Study addressing Alternatives C and H identified in the System Impact Study. These two alternatives will provide for a total of 300 MW of capacity. The SIS determined that the following Network modifications are required:

For Alternative C (which accommodates 200 MW):

- Install 50 MVAR of switchable capacitor banks at Archer, Laramie, Stegall and Wray 115-kV substation busses.
- Install a 600 MVA 345/230-kV transformer at Archer substation and connect the LRS-Story 345-kV line at Archer.
- Construct a 230-kV line from Archer-Cheyenne.

For Alternative H (which accommodates an additional 100 MW):

- All of C above plus:
- Construct a 230-kV line from Stegall-Story

Letter Agreement No. 07-RMR-1688 was executed on March 22, 2007, and provides for the completion of a Facility Study and corresponding final report that summarizes the required system modifications, additions, costs and schedule for the project.

This Interconnection Facilities Study shall specify and estimate the cost of the equipment, engineering, procurement and construction work needed to implement the conclusions of the System Impact Study.

2. Description of Existing Western Facilities Related to Interconnection Request

Western owns, operates, and maintains the Laramie, Archer, Stegall, Wray and Cheyenne Substations.

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3. Description of Required Additional Facilities

The additional facilities required to accommodate the requested 300 MW capacity transfer across TOT3 consists of the following:

For the initial 200 MW capacity, it will be necessary to install 50 MVAR of switchable capacitor banks to the 115-kV busses at the Laramie, Archer, Stegall and Wray substations. At Archer substation, install a 600 MVA 345/230-kV transformer and associated 345-kV 2000 amp, three power circuit breaker ring bus and 230-kV 2000 amp main and transfer bay as well as a 230-kV 2000 amp main and transfer bay for a new 230-kV transmission line to be constructed to the Cheyenne substation. Construct a new 230-kV transmission line from Archer to Cheyenne substations. At Cheyenne, install 230-kV 2000 amp bus tie bay, associated 230-kV bus work and takeoff structure.

For the additional 100 MW capacity, it will be necessary to construct a new 230-kV transmission line from Stegall to Story substations with associated terminal equipment at both substations.

B. SUMMARY OF EXISTING STUDIES

1. SIS Requirements

A Feasibility Study was not performed for this Firm Point-to-Point Transmission request.

The SIS was completed by the customer on July 17, 2006. The study identified Network modifications necessary to accommodate the requested capacity of 300 MW in two increments, 200 MW and 100 MW.

2. Environmental Studies

The customer will make a separate request for Western to perform environmental work.

C. STUDY REQUIREMENTS

Western performed this Facilities Study to determine upgrades or modifications needed to support the Firm Point-to-Point transmission requests. This study also includes estimates of the cost and schedule required to perform the facility design, material procurement and construction.

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1. **Contracts**

Letter Agreement No. 07-RMR-1688, between Western and the customer, was executed on March 22, 2007. The letter agreement provides for the completion of a Facility Study and associated final report.

2. **Interconnection Facilities**

None.

3. **Network Modifications/Upgrades and Additions**

For the initial 200 MW request; Install 50 MVAR of switchable capacitor banks at Archer, Laramie, Stegall and Wray 115-kV substation busses. Install a 600 MVA 345/230-kV transformer at Archer substation and connect the LRS-Story 345-kV line at Archer. Construct a 230-kV line from Archer-Cheyenne.

For the additional 100 MW request; All of the above plus construct a 230-kV line from Stegall-Story.

4. **Schedule**

The customer requested that the network modifications be effective January 1, 2010. This timeframe cannot be reasonably accommodated by Western. Western will not have 230-kV transmission facilities in place between Miracle Mile and Cheyenne substations until September 2009. The earliest effective date of the Network modifications described in this Facility Study is December 31, 2012.

D. STUDY RESULTS

This Facility Study Report defines the requirements needed to accommodate the customers requested network modifications needed to provide 300 MW of Firm Point-to-Point Transmission service between the Dave Johnston 230-kV Bus and the Ault 345-kV Bus.

1. **Description of Interconnection Facility**

None.

2. **Network Modifications**

The following Network modifications would be required:

For the initial 200 MW request:

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Laramie Substation

Furnish and install one 115-kV, 1600 amp bus tie bay, two 115-kV interrupter switches with ground blades, one 115-kV disconnect switch with ground blades and three 115-kV 16.67 MVAR capacitor banks. Table 1 identifies the associated cost estimate for the Laramie Substation capacitor bank additions.

Table 1
Laramie Substation Cap Bank Cost Estimate

TASK DESCRIPTION	COST*
Project Management	\$25,000
Planning/Field Data	\$5,000
Design	\$145,000
Procurement	\$5,000
Construction Management	\$50,000
Construction Contract	\$1,145,000
Commissioning	\$50,000
Miscellaneous 1% (Lands, Contracts, Contingency)	\$15,000
Inflation (2%/year and 2011 construction=8%)	\$115,000
TOTAL:	\$1,555,000

** The budgetary level estimate is intended to be accurate to +/- 20%.*

Wray Substation

Furnish and install one 115-kV, 1600 amp bus tie bay, two 115-kV interrupter switches with ground blades, one 115-kV disconnect switch with ground blades, three 115-kV 16.67 MVAR capacitor banks, one 115-kV H-Frame structure, one 115-kV take-off structure and 115-kV overhead bus. Table 2 identifies the associated cost estimate for the Wray Substation capacitor bank additions.

Table 2
Wray Substation Cap Bank Cost Estimate

TASK DESCRIPTION	COST*
Project Management	\$30,000
Planning/Field Data	\$5,000
Design	\$158,000
Procurement	\$5,000
Construction Management	\$50,000
Construction Contract	\$1,200,000
Commissioning	\$50,000
Miscellaneous 1% (Lands, Contracts, Contingency)	\$15,000
Inflation (2%/year and 2011 construction=8%)	\$120,000
TOTAL:	\$1,633,000

** The budgetary level estimate is intended to be accurate to +/- 20%.*

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Archer Substation

Furnish and install one 115-kV, 1600 amp main and transfer bay, two 115-kV interrupter switches with ground blades, one 115-kV disconnect switch with ground blades, and three 115-kV 16.67 MVAR capacitor banks. Table 3 identifies the associated cost estimate for the Archer Substation capacitor bank additions.

**Table 3
Archer Substation Cap Bank Cost Estimate**

TASK DESCRIPTION	COST*
Project Management	\$32,000
Planning/Field Data	\$5,000
Design	\$145,000
Procurement	\$5,000
Construction Management	\$50,000
Construction Contract	\$1,345,000
Commissioning	\$50,000
Miscellaneous 1% (Lands, Contracts, Contingency)	\$15,000
Inflation (2%/year and 2011 construction=8%)	\$130,000
TOTAL:	\$1,777,000

* The budgetary level estimate is intended to be accurate to +/- 20%.

Furnish and install a 345-kV, 2000 amp three power circuit breaker ring bus, 345/230-13.8kV 600 MVA transformer, and 230-kV, 2000 amp main and transfer bay. Table 4 identifies the associated cost estimate for these Archer Substation additions.

**Table 4
Archer Substation Transformer Cost Estimate**

TASK DESCRIPTION	COST*
Project Management	\$200,000
Planning/Field Data	\$15,000
Design	\$392,000
Procurement	\$25,000
Construction Management	\$350,000
Construction Contract	\$8,995,000
Commissioning	\$200,000
Miscellaneous 1% (Lands, Contracts, Contingency)	\$100,000
Inflation (2%/year and 2011 construction=8%)	\$800,000
TOTAL:	\$11,077,000

* The budgetary level estimate is intended to be accurate to +/- 20%.

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For the 230-kV Archer-Cheyenne transmission line, at Archer, furnish and install 230-kV, 2000 amp main and transfer bay. Table 5 identifies the associated cost estimate for these Archer Substation additions.

Table 5
Archer Substation Line Bay Cost Estimate

TASK DESCRIPTION	COST*
Project Management	\$27,000
Planning/Field Data	\$5,000
Design	\$155,000
Procurement	\$5,000
Construction Management	\$50,000
Construction Contract	\$1,075,000
Commissioning	\$50,000
Miscellaneous 1% (Lands, Contracts, Contingency)	\$14,000
Inflation (2%/year and 2011 construction=8%)	\$110,000
TOTAL:	\$1,491,000

* The budgetary level estimate is intended to be accurate to +/- 20%.

Stegall Substation

Furnish and install one 115-kV, 1600 amp main and transfer bay, two 115-kV interrupter switches with ground blades, one 115-kV disconnect switch with ground blades, and three 115-kV 16.67 MVAR capacitor banks. Table 6 identifies the associated cost estimate for the Stegall Substation capacitor bank additions.

Table 6
Stegall Substation Cap Bank Cost Estimate

TASK DESCRIPTION	COST*
Project Management	\$32,000
Planning/Field Data	\$5,000
Design	\$145,000
Procurement	\$5,000
Construction Management	\$50,000
Construction Contract	\$1,345,000
Commissioning	\$50,000
Miscellaneous 1% (Lands, Contracts, Contingency)	\$15,000
Inflation (2%/year and 2011 construction=8%)	\$130,000
TOTAL:	\$1,777,000

* The budgetary level estimate is intended to be accurate to +/- 20%.

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Cheyenne Substation

In the Cheyenne Substation 230-kV ring bus, furnish and install one 230-kV, 2000 amp bus tie bay, and 230-kV bus work and takeoff structure. Table 7 identifies the associated cost estimate for the Cheyenne Substation additions.

**Table 7
Cheyenne Substation Line Bay Cost Estimate**

TASK DESCRIPTION	COST*
Project Management	\$27,000
Planning/Field Data	\$5,000
Design	\$146,000
Procurement	\$5,000
Construction Management	\$50,000
Construction Contract	\$1,090,000
Commissioning	\$50,000
Miscellaneous 1% (Lands, Contracts, Contingency)	\$14,000
Inflation (2%/year and 2011 construction=8%)	<u>\$111,000</u>
TOTAL:	\$1,498,000

* The budgetary level estimate is intended to be accurate to +/- 20%.

Archer-Cheyenne TL

The new 230kV transmission line from the Archer Substation to the Cheyenne Substation would be approximately 10 miles long. This transmission line would be designed with wood H-frame structures, 1272kCM ACSR ("Bittern") conductor and two overhead ground wires - one overhead optical ground wire (OPGW) and one steel overhead ground wire.

Table 8 identifies the associated cost estimate for the Archer-Cheyenne 230kV TL.

**Table 8
Archer-Cheyenne 230kV TL Cost Estimate**

TASK DESCRIPTION	COST*
Project Management	\$171,000
Planning/Field Data	\$75,000
Lands	\$3,175,000
Design	\$208,605
Procurement	\$25,000
Construction Management	\$670,000
Construction Contract	\$4,400,000
Miscellaneous 1% (Contracts, Contingency)	\$88,000
Inflation (2%/year and 2011 construction=8%)	<u>\$705,000</u>
TOTAL:	\$9,517,605

* The budgetary level estimate is intended to be accurate to +/- 20%

Facilities Study for customer

Total Cost Estimate for the Initial 200 MW

The separate cost estimates for additions to the Laramie, Cheyenne, Wray, Stegall, and Archer Substations as well as the cost estimates for the new 230kV transmission line from the Archer Substation to the Cheyenne Substation are added together in Table 9 to make a total cost estimate for the initial 200 MW requested (Alternative C).

Table 9
Total Cost Estimate

Description	Cost*
Laramie Substation Additions	\$1,555,000
Wray Substation Additions	\$1,633,000
Archer Substation Additions	\$14,345,000
Stegall Substation Additions	\$1,777,000
Cheyenne Substation Additions	\$1,498,000
Archer-Cheyenne 230kV TL	\$9,517,605
Total	\$30,325,605

* *The budgetary level estimate is intended to be accurate to +/- 20%*

For the additional 100 MW request (for a total of 300 MW):

Story Substation

Two 230kV, 2000 Amp, SF-6 power circuit breakers and four 230kV, manual gang-operated disconnect switches will be installed as a portion of a breaker-and-one-half bus arrangement. Also included would be the necessary buswork, supports, jumpers and ground switches as well as the protection and control equipment, cabling and communications equipment. Tri-State Generation and Transmission Association, Inc. (Tri-State), as the affected party, would need to be contacted to coordinate the work at Story Substation since they own the substation.

Facilities Study for customer

Table 10 identifies the associated cost estimate for the Story Substation additions.

**Table 10
Story Substation Cost Estimate**

TASK DESCRIPTION	COST*
Project Management	\$55,000
Planning/Field Data	\$10,000
Design	\$165,000
Procurement	\$15,000
Construction Management	\$120,000
Construction Contract	\$2,112,000
Commissioning	\$75,000
Miscellaneous 10% (Lands, Contracts, Contingency)	\$250,000
Inflation (2%/year and 2011 construction=8%)	\$224,000
TOTAL:	\$3,026,000

** The budgetary level estimate is intended to be accurate to +/- 20%.*

Stegall Substation

For the 230-kV Stegall-Story transmission line, at Stegall, furnish and install 230-kV, 2000 amp main and transfer bay. Table 11 identifies the associated cost estimate for these Stegall Substation additions.

**Table 11
Stegall Substation Cost Estimate**

TASK DESCRIPTION	COST*
Project Management	\$27,000
Planning/Field Data	\$5,000
Design	\$136,000
Procurement	\$5,000
Construction Management	\$50,000
Construction Contract	\$1,075,000
Commissioning	\$50,000
Miscellaneous 1% (Lands, Contracts, Contingency)	\$14,000
Inflation (2%/year and 2011 construction=8%)	\$110,000
TOTAL:	\$1,472,000

** The budgetary level estimate is intended to be accurate to +/- 20%.*

Stegall – Story TL

The new 230kV transmission line from the Stegall Substation to the Story Substation would be approximately 146 miles long. This transmission line would be

Facilities Study for customer

designed with wood H-frame structures, 1272kCM ACSR (“Bittern”) conductor and two overhead ground wires - one overhead optical ground wire (OPGW) and one steel overhead ground wire. A communications signal regeneration station is also included.

Table 12 identifies the associated cost estimate for the Stegall – Story 230kV TL.

Table 12
Stegall - Story 230kV TL Cost Estimate

TASK DESCRIPTION	COST*
Project Management	\$900,000
Planning/Field Data	\$575,100
Lands	\$5,000,000
Design	\$2,037,990
Procurement	\$25,000
Construction Management	\$1,670,000
Construction Contract	\$35,620,000
Miscellaneous 1% (Contracts, Contingency)	\$450,000
Inflation (2%/year and 2011 construction=8%)	<u>\$3,702,000</u>
TOTAL:	\$49,980,090

* *The budgetary level estimate is intended to be accurate to +/- 20%*

Total Cost Estimate

The separate cost estimates for the initial 200 MW request as well as the cost estimates for the additional 100 MW request are added together in Table 13 to make a total cost estimate.

Table 13
Total Cost Estimate

Description	Cost*
Stegall Substation Additions	\$1,472,000
Story Substation Additions	\$3,026,000
Stegall-Story 230kV TL	\$49,980,090
Initial 200 MW Request Subtotal	<u>\$30,325,605</u>
Total	\$84,803,695

* *The budgetary level estimate is intended to be accurate to +/- 20%*

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3. Operations Requirements

An Agreement between Western and the customer to define design and construction requirements and responsibilities of ownership, operation, maintenance and replacement must be executed prior to energization of the Network modifications. This Agreement or other agreement will set forth funding required from customer for long-term operations and maintenance costs associated with the Network modifications. Standard Operating Procedures for the Network modifications would be written in accordance with Western requirements.

4. Schedule

The customer requested that the Network modifications be effective January 1, 2010. This timeframe cannot be reasonably accommodated by Western. Western has ongoing construction projects that need to be completed and there are proposed construction projects linked to earlier transmission queue positions that would need to be completed in order to validate the SIS that this FS is based on. Therefore, the earliest effective date of the Network modifications described in this FS is December 31, 2012. This date is based on the expected completion dates of related projects that need to be completed prior to the effective date of the Network modifications described in this FS. Please refer to Table 14 for the proposed project schedule.

Facilities Study for customer

**Table 14
Proposed Project Schedule**

ACTIVITY	START	COMPLETION
Agreement Development/Negotiations	October 2007	March 2008
Environmental Review	March 2008	August 2009
Environmental Determination		September 2009
Agreement Execution		October 2009
Receipt of Funding (if Western designs/constructs)		October 2009
230kV & 345kV Substation Additions:		
Planning/Field Data	October 2009	February 2010
Design	March 2010	September 2010
Equipment Purchase	October 2010	October 2011
Construction Contract Solicitation	April 2011	June 2011
Award of Construction Contract		July 2011
Construction Contract Performance	September 2011	September 2012
Commissioning	October 2012	December 2012
In-service Date		December 2012
230kV Transmission Lines:		
Planning	August 2008	August 2009
Field Data	October 2009	April 2010
Lands	October 2009	September 2010
Design	April 2010	November 2010
Construction Contract Solicitation	January 2011	March 2011
Award of Construction Contract		April 2011
Construction Contract Performance	June 2011	November 2012
In-service Date		December 2012

**The substation construction activities are coordinated with the anticipated 230kV transmission line completion, to avoid premature installation of equipment that cannot be energized until the transmission line is energized.*

E. Environmental Requirements

It is the customer's responsibility to sign a separate agreement and provide funding for Western to perform the Environmental Review.