

FINAL
FACILITIES STUDY

WILDHORSE CREEK SUBSTATION

Revision #1

March 24, 2008

Prepared by: Dave Golden

[Revised 3 Apr 08, for public posting]



Facilities Study for Wildhorse Creek Substation

1. DESCRIPTION

1.1. Background of Request

Per a LGIP Facilities Study Agreement dated April 27, 2006, 2005-G1, requested a facilities study for an interconnection to Western Area Power Administration's (Western) transmission system on the 115-kV Sterling – Frenchman Creek transmission line located in northeast Colorado. The requested interconnection is in the vicinity of Western structures 24-1 and 24-2 which are located approximately 4.5 miles east of the Fleming Substation.

2005-G1 has requested that construction begin 5/1/2009, with Commercial Operation commencing 1/2/2010.

Western performed a System Impact Study **Addendum dated March 2008** to determine the impacts, if any, to Western's transmission system of the proposed interconnection. The System Impact Study results found that **70** MW of generation would have no significant adverse affects on Western's 115-kV system in the area. The System Impact Study **Addendum dated March 2008** results found that the requested **90** MW would require the installation of transmission upgrades.

This Facilities Study provides for general description and cost estimates for the Network upgrades required for the interconnection to Western's Sterling – Frenchman Creek 115-kV transmission line. This includes all major 115-kV equipment, switchyard land, control building, relay and control system, communication, metering requirements and modifications to the transmission line.

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 Interconnection System Impact Study in accordance with Good Utility Practice to physically and electrically connect the Interconnection Facility to the Transmission system. The Interconnection Facility Study shall also identify the electrical switching configuration of the connection equipment, including, without limitation: the transformer, switchgear, meters, and other station equipment; the nature and estimated cost of any Transmission Provider's Interconnection Facilities and Network Upgrades necessary to accomplish the interconnection; and an estimate of the time required to complete the construction and installation of such facilities.

A Draft Facility Study was prepared and submitted August 18, 2006. This Final Facility Study was prepared to incorporate any customer comments received on the Draft Study.

Facilities Study for Wildhorse Creek Substation

1.2. Description of Connection Facility

In order to connect the customer to Western's Sterling – Frenchman Creek 115-kV line, a sectionalizing switchyard will need to be installed. Western requires the installation of a 115-kV three breaker ring bus configuration to meet the sectionalizing requirements. It is assumed that the customer's 115/34.5-kV transformer and associated equipment will be located within the new substation.

1.3. Description of Existing Western Facilities Related to Interconnection Request

Western owns, operates, and maintains a 115-kV transmission line from the Sterling substation to the Frenchman Creek substation. The line is approximately 47.1 miles long and has a thermal rating of 80 MVA. The thermal rating of the line is due to the settings of the Current Transformers associated with breakers at Sterling, Frenchman Creek and Wauneta substations.

Associated with the **90** MW generation interconnection is the Western owned Archer – Stegall 230-kV line which is approximately 61.2 miles long. This line is approximately 40 years old constructed with lattice steel towers, 1272 ACSR conductor with a resulting **459** MVA rating.

2. SUMMARY OF EXISTING STUDIES

2.1. SIS Requirements

There was not a Feasibility Study performed associated with this interconnection request.

A System Impact Study (SIS) **Addendum** was performed **March 2008** and the SIS Report was forwarded to 2005-G1. The SIS performed was an "**interconnection only**" study for the transmission interconnection. The SIS concluded that the Transmission Interconnection could be accommodated for **70** MW of generation with minimal transmission upgrades.

The SIS **Addendum** concluded that the Transmission Interconnection for **90** MW of generation would require at a minimum, reconductoring the Archer – Stegall 230-kV line **with 954 ACSS Canvasback conductor**. 345-kV equipment, switches and current transformers, located at the Ault and Laramie River substations would also need to be replaced.

There is an associated transmission service request, 2007-T1, related to the transmission interconnection.

Facilities Study for Wildhorse Creek Substation

2.2. Environmental Studies

Currently there is not a contract between Western and 2005-G1 for environmental studies to be performed associated with this facility. It is the customer's responsibility to sign a separate agreement and provide funding to Western for performance of environmental reviews and studies for the interconnection facility and the associated applicant facilities.

3. STUDY REQUIREMENTS

Western performed this Facilities Study to specify and estimate the cost of the equipment, engineering, procurement and construction work needed to implement the conclusions of the Interconnection System Impact Study *Addendum dated March 2008*.

Western will perform/develop a substation layout, perform a preliminary bus design, determine all electrical equipment requirements, and determine a suitable site location to accommodate the Request and future transmission needs. Develop/compile cost estimates for all Western labor, overheads, equipment additions, modifications, etc.

3.1. Interconnection Facilities

By definition provided in the LGIP Manual, Interconnection Facilities shall mean the Transmission Provider's Interconnection Facilities and the Interconnection Customer's Interconnection Facilities. Collectively, Interconnection Facilities include all facilities and equipment between the Generating Facility and the Point of Interconnection, including any modification, additions or upgrades that are necessary to physically and electrically interconnect the Generating Facility to the Transmission Provider's Transmission System.

3.2. Network Modifications/Upgrades and Additions

By definition provided in the LGIP Manual, Network Upgrades shall mean the additions, modifications, and upgrades to the Transmission Provider's Transmission System required at or beyond the point at which the Interconnection Facilities connect to the Transmission Provider's Transmission System to accommodate the interconnection of the Large Generating Facility to the Transmission Provider's Transmission System.

Western will review and document any interconnection/control area requirements. Document these additional requirements (such as indication/metering, monitoring, control, relaying, network upgrades and transmission line upgrades) and include these in the cost estimate.

Facilities Study for Wildhorse Creek Substation

3.3. Schedule

Develop an overall time schedule for completion of the necessary addition/modifications to meet (if reasonably possible) the requested in-service date.

3.4. Environmental Requirements

Develop a scope, schedule and cost estimate for the environmental work associated with this Request.

4. STUDY RESULTS

This study was prepared for the **70 MW** and **90 MW** interconnection request based on recommendations contained in the System Impact Study Report **Addendum dated March 2008.**

4.1. Description of Interconnection Facility (see Attachment A)

a) Transmission Provider's Interconnection Facility

- Metering equipment and associated metering class instrument transformers
- One - 115-kV manual gang-operated disconnecting switch

b) Interconnection Customer's Interconnection Facilities

It is expected that customer will install 34.5-kV line from generation facility to a location within a new Western substation.

- One – 115/34.5-kV transformer (assumed located within the substation) (NOTE: This equipment is not included in cost estimate)
- One – 115-kV, 1200 amp power circuit breaker or equivalent interrupter for transformer protection
- Metering equipment may be located on low side of transformer

4.2. Network Improvements (see Attachment B & C)

a) A new substation, to be known as Wildhorse Creek Substation would be constructed directly adjacent to Western's transmission line, just south of US Highway 6. It is recommended that the substation be off-set from the transmission line to allow the substation to be constructed without building a T-Line shoo-fly. This will also save acquiring additional T-Line right of way for the shoo-fly. The substation would be configured as a three breaker ring bus arrangement and would consist of the following equipment:

- Three - 115-kV, 1200 amp, SF6 power circuit breakers
- Six - 115-kV manual gang-operated disconnecting switches
- Two - 115-kV manual gang-operated disconnecting switches with ground blades

Facilities Study for Wildhorse Creek Substation

- Instrument transformers for control and relaying
- Station service equipment, including transformers, distribution switchgear, 125-kV batteries and chargers.
- Relay and control equipment
- Communication equipment and tower:

The communication requirement will involve the installation of a microwave system along with digital radios. It was assumed communications will require a radio system, i.e. monopole and associated equipment.

Communication is required from Western's operation center located in Loveland, Colorado to the substation to provide for remote control of equipment, obtain alarm, status, and metering data from the substation, relay communications requirements and provide a voice link to the substation.

The proposed substation is approximately 7 miles to Western's Haxtun site with a direct line of sight. A 7 GHz microwave radio could be used with an antenna mounted on a 40-foot high communication structure. Western will design, procure, and install all communication equipment necessary for communication from the substation to Western's operation center.

- Control Building (approximately 1200 sq. ft.)
- Two - 115-kV transmission line tap structures

To support the interconnection of the **70 MW** generator, the metering current transformers at Wauneta Substation need to be replaced with 300/600:5A CT's with a thermal rating of 1.5. The existing wave traps at Sterling, Fleming and Frenchman Creek are adequate for this **70 MW** addition. Several current transformers at Sterling, Frenchman Creek and Wauneta Substations will also need their ratios changed.

The estimated cost for Western's labor, overheads, equipment additions, modifications, land, and other miscellaneous costs are outlined in Attachment B.

- b) The cost associated with connecting an additional **20 MW** to obtain a **90 MW** interconnection is outlined in Attachment C. The total cost includes everything shown in 4.2.a, above, in addition to the following: An estimate is provided for reconductoring the Archer-Stegall 230-kV transmission line. Installation of the **954 ACSS Canvasback**. **954 ACSS Canvasback** provides a rating of **669 MVA**. Replacement of 12 manual operated disconnect switches and 1 motor operated disconnect switch at the 345-kV Laramie River Station, as well as replacement of 4 motor operated

Facilities Study for Wildhorse Creek Substation

disconnect switches and 1 wave trap at the 345-kV Ault substation is also required.

4.3. Operations Requirements

An Interconnection Agreement is required prior to energization. An Operating Guide will be developed by Western to outline the necessary operating restrictions on the wind farm. Specific restrictions could be related to operating limits of existing line facilities that are affected by line or facility outages, scheduled or unscheduled. Coordination of the proposed work at all affected facilities could affect the generation output capability until all work is completed.

Facilities Study for Wildhorse Creek Substation

4.4. Schedule

Western is prepared to meet the proposed schedule in this document, if the design work begins as shown. If the project is delayed, Western will reevaluate equipment lead times, workload, and construction seasons to determine a reasonable schedule.

NOTE:

The schedule shown is for the **70 MW** generation interconnection only. Interconnection of the **90 MW** generation may require additional time caused by outage constraints due to load flow paths across TOT3 and will also require coordination with other Generation Unit scheduled outages. **NOTE: This schedule has been updated to reflect the Addendum to the SIS and the revision to this Facility Study.**

PROPOSED PROJECT SCHEDULE

Activity	Start	Completion
Large Generator Interconnection Agreement Draft and Environmental Agreement/Contract	July 2008	August 2008
Environmental	August 2008	July 2009
Environmental Record of Decision		August 2009
LGIA Final *	August 2009	September 2009
Planning	April 2009	May 2009
Field Data	May 2009	July 2009
Land Acquisition	August 2009	October 2009
Design	August 2009	March 2010
Construction Contract Procurement	April 2010	May 2010
Award of Construction Contract		June 2010
Construction Contract Performance Period	July 2010	March 2011
Commissioning	February 2011	April 2011
In-service Date		May 1, 2011

* LGIA Final cannot be signed until Environmental Review is completed

4.5. Environmental Requirements

Western requires an Environmental Assessment (“EA”) to comply with the National Environmental Policy Act (NEPA) requirements. In addition, Western must demonstrate compliance with several other environmental regulations including, but not limited to the Endangered Species Act, The

Facilities Study for Wildhorse Creek Substation

migratory Bird Treaty Act, The National Historic Preservation Act, The Clean Water Act, and the Clean Air Act. The following assumptions were taken into account in preparing the estimate:

1. The Applicant procures and manages the contractors for preparing the EA and other required documentation to Western's specifications.
2. The Applicant procures and manages the contractors for cultural and biological surveys to Western's specifications and the requirements of the regulatory agencies
3. The Applicant or their contractor publishes the Pre-approval Draft EA and Final EA and distributes it to Western's requirements
4. The applicant undertakes the majority of coordination with the US Fish and Wildlife Service, State Wildlife Agencies, other Regulatory agencies for the purposes of clarifying each agency's requirements, providing information each agency may need to fulfill their respective obligations and reviews.
5. Western shall review all documentation to ensure it complies with Western's requirements and is sufficient to support Western's decisions or other actions under the regulations. The Applicant shall ensure that Western's review comments are incorporated into the reports and other documentation.
6. The project is not controversial and extensive public involvement is not required.
7. The Applicant assumes responsibility for the majority of project meetings with local and state agencies (e.g. Wildlife agencies, County commissioners and planners and cities).
8. Western coordinates with regulatory agencies to the extent required by the regulations and sends letters, signs agreements, or undertakes other required government-to-government communications.
9. The Applicant at no time will commit Western to a course of action or speak on behalf of Western in matters concerning policy, commitment of Federal resources or other matters related to Western's legal responsibilities under the various regulations.
10. That the EA is sufficient to support the preparation of a Finding of No Significant Impact, otherwise an Environmental Impact Statement (EIS) may be required.

Generally, \$40,000-50,000 is estimated for Western's costs for environmental reviews and approvals if no other lead agencies were involved.

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

ATTACHMENT A

COST ESTIMATE FOR INTERCONNECTION CUSTOMER'S INTERCONNECTION FACILITIES

Wildhorse Creek Substation – 2005-G1
Design and Construction Budgetary Cost
Estimates
July 13, 2006

<u>Description</u>	<u>Cost</u>
Furnish & Install 115-kV, 1200A Switch and breaker bay	\$ 357,000
Planning/Field Data	\$ 5,000
Design	\$ 50,000
Construction Management	\$ 50,000
Commissioning	\$ 50,000
Project Management	\$ 10,000
Procurement/Contract Administration	\$ 5,000
TOTAL	\$ 527,000

Notes:

- 1) The above is a budgetary level estimate intended to be accurate to +/-10%
- 2) Does not include Transmission Provider's Network Upgrades.

ATTACHMENT B

COST ESTIMATE for NETWORK UPGRADES for 70 MW OPTION

Wildhorse Creek Substation – 2005-G1
Design and Construction Budgetary Cost
Estimates
July 13, 2006

<u>Description</u>	<u>Cost</u>
WILDHORSE CREEK	
Construction Costs	\$ 1,805,000
Communication Equipment	\$ 147,077
New CT's for Wauneta Sub	\$ 52,500
Land	\$ 100,000
Western Labor Costs	
Planning/Field Data	\$ 25,000
Environment	\$ 41,000
Design	\$ 415,000
Construction Management	\$ 300,000
Commissioning	\$ 200,000
Project Management	\$ 50,000
Procurement/Contract Administration	\$ 10,000
 TOTAL	 \$3, 145,577

Notes:

- 1) The above is a budgetary level estimate intended to be accurate to +/-10%
- 2) The estimate does not include the design and construction cost of a new access road to the substation, if it is required.
- 3) The estimate does not include the design and construction of the ICIF such as a transformer and low side equipment.

ATTACHMENT C

Facilities Study for Wildhorse Creek Substation

COST ESTIMATE for NETWORK UPGRADES for 90 MW OPTION

Wildhorse Creek Substation – 2005-G1
Design and Construction Budgetary Cost
Estimates
July 13, 2006

<u>Description</u>	<u>Cost</u>
WILDHORSE CREEK	
Construction Costs	\$ 1,805,000
Communication Equipment	\$ 147,077
New CT's for Wauneta Sub	\$ 52,500
Land	\$ 100,000
Western Labor Costs	
Planning/Field Data	\$ 25,000
Environment	\$ 41,000
Design	\$ 415,000
Construction Management	\$ 300,000
Commissioning	\$ 200,000
Project Management	\$ 50,000
Procurement/Contract Administration	\$ 10,000

WILDHORSE CREEK SUB-TOTAL \$ 3,145,577

Description	Design Est.	Construction Est.
Reconductor the ARH-SG 230-kV T-Line 954 ACSS Canvasback	\$ 100,000	\$ 4,440,000
Electrical equipment replacement (230-kV) at Archer & Stegall Substations	\$ 5,000	\$ 102,000
Electrical equipment replacement (345-kV) at Ault & Laramie River Station	\$ 22,000	\$ 629,000
Total Cost (with Sub-total from above)		\$ 8,443,577

Notes:

1. The above is a budgetary level estimate intended to be accurate to +/-10%
2. The estimate does not include the design and construction cost of a new access road to the substation, if it is required.
3. This estimate does not include the design and construction of the ICIF such as a transformer and low side equipment.

ATTACHMENT D

Facilities Study for Wildhorse Creek Substation

PROPOSED SWITCHING DIAGRAM