

CALIFORNIA HIGH SPEED TRAIN PROJECT

SITE:

SYSTEM IMPACT STUDY SUBSTATION SUMMARY

Prepared for
Pacific Gas and Electric Company



November 14, 2012



9400 Ward Pkwy, Kansas City, MO 64114

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Cost Summary

Bakersfield ATF – 13

**COST SUMMARY
CHSTP SITE BAKERSFIELD ATF-13**

Facility	Item	UNIT COST
New 115kV Redacted Redacted Switching Station	<ul style="list-style-type: none"> Install new 115kV loop switching station with two (2) 115kV circuit breaker. Install two (2) complete underground termination structures for termination of 15kV underground cables. 	\$5,000,000
Redacted Substation	<ul style="list-style-type: none"> Replace one (1) Line Protection Package 	\$600,000
Redacted Substation	<ul style="list-style-type: none"> Replace one (1) Line Protection Package 	\$600,000
Transmission Line	<ul style="list-style-type: none"> Modifications to the existing Redacted Redacted 115kV Line (underground loop). Reconductor sections of the Redacted Redacted and Redacted Redacted 115kV lines for overload mitigation. 	\$10,760,000
SUBTOTAL BEFORE APPLYING ANY ITCC TAX		\$16,960,000.00

Notes:

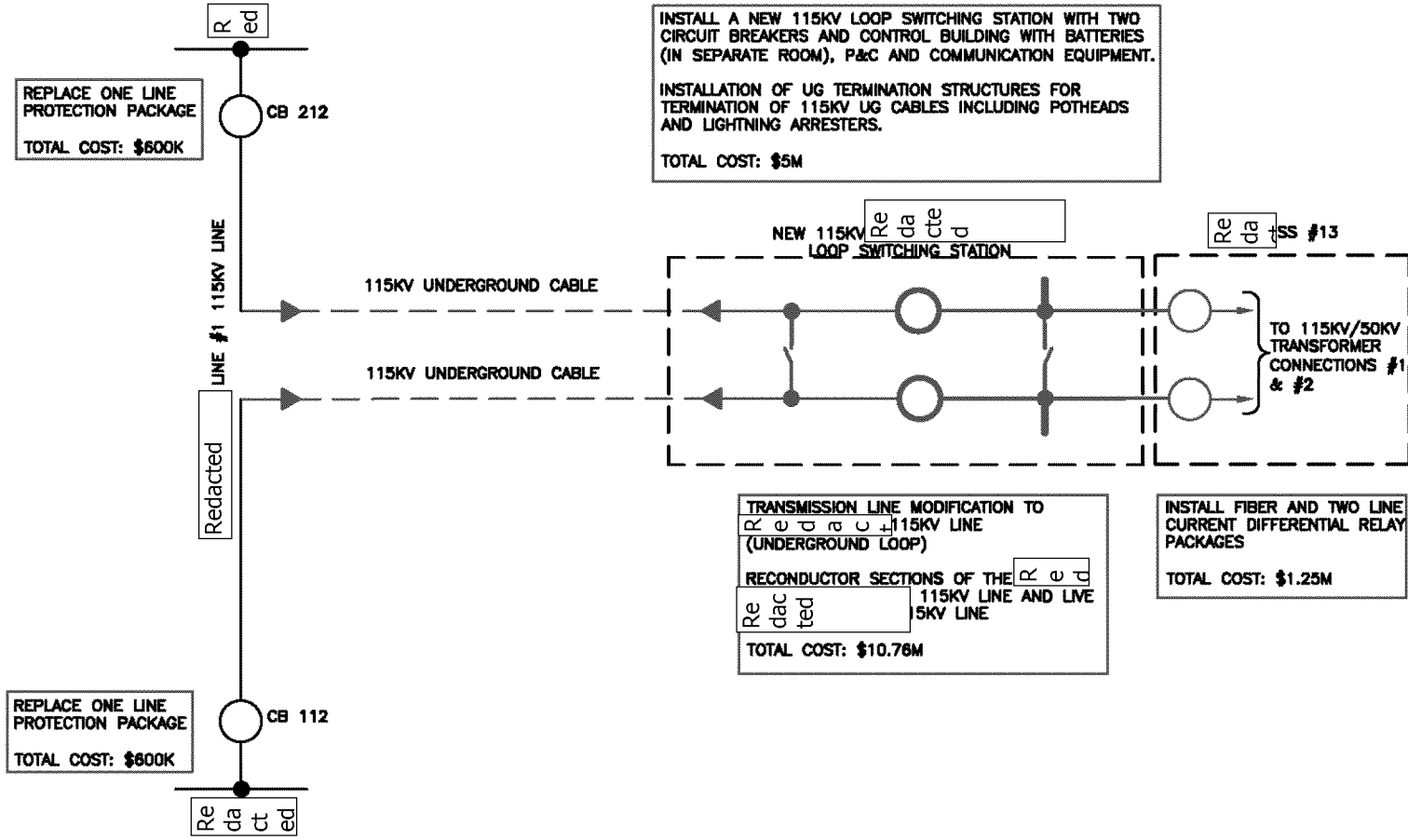
1. This estimate is preliminary. Accuracy is expected to be +/-50%.

Single Line Diagram

Redacted

Redacted

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Substation Scope

Redacted

Redacted

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Redacted

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Assumptions and Clarifications

The California High Speed Train Project (CHSTP) involves the construction of a 345 mile rail alignment on the PG&E grid territory. In order to supply power to the electric train, the train system will connect to 13 Traction Power Supply Substations (SS) with approximately 30 miles of spacing between each. This document addresses the work that will be done at PG&E facilities to allow for the interconnection of Redacted in the Bakersfield area.

Below are the assumptions and clarifications used to define the scope of work for this study.

1. This proposed substation scope is based upon the final version of document "California High Speed Train Project Technical Study Plan" dated March 29th, 2011, as amended by draft document "California High Speed Train Project Phase I Technical Study Report", dated September 7, 2012.
2. Scope of Work is written at a high-level. Detailed Scope of Work will be developed when the project moves to implementation phase.
3. Scope of Work and associated cost estimates are based on PG&E standard design and construction practices.
4. The estimated costs here do not include any applicable ITCC tax.
5. Cost estimates assume that the project site has regular soil conditions and is not located in an extra high seismic zone as identified in PG&E DCM 073102 nor in a locations consisting of the following conditions: liquefiable soils, expansive soils, unstable soils, susceptible to rupture, high ground water table (less than approximately 15 feet below finish grade), FEMA flood zone(s), excessive ground settlement due to subsidence or other geological factors, and hilly and/or rocky terrain requiring substantial grading effort.
6. Cost estimates also assume that the site can be drained via customary storm water drainage infrastructure (i.e., without pump or lift stations) and not require on-site percolation basins. Costs assume including implementing Storm Water Pollution and Prevention (SWPP) and SPCC oil containment system(s).
7. Cost estimates assume that the on-site existing soil is adequate for engineered fill and can be reused on-site to achieve a balanced cut-fill earthwork volume. Costs do not assume removal of hazardous material or site remediation.
8. Cost estimates assume that the site has nearby easy access to public roads and does not include any costs for access roads outside the substation. Additionally, costs assume that existing access roads are adequate for heavy haul route.
9. Cost estimates do not include extensive permitting effort.
10. Cost estimates do not include any remedial work for impact on neighboring properties.
11. Land Survey has not been conducted for preparation of this report. Therefore, cost estimates assume a generally flat site with a minimal amount of site grading required.
12. Geotechnical investigations have not been performed at the sites and, therefore, cost estimates do not include specific design or construction means that may be required due to local soil conditions.
13. Cost estimates do not include right-of-way acquisition.
14. Cost estimates do not include any land acquisition.
15. Cost estimates do not include extensive environmental mitigation.
16. Cost estimates do not include the installation of telecommunication channels for protective relaying, SCADA/Telemetry and metering.

17. California High Speed Rail Authority (CHSRA) will be solely responsible for the installation of communication channels between PG&E facilities and the CHSRA facilities, for protection, SCADA/Telemetry, and metering.
18. The Point of Interconnection (POI) is the customer's transmission bus in the [Redacted] [Redacted] Substation (SS). PG&E will own and maintain the transmission lines serving the [Redacted] SS facility.
19. The Scope of Work and cost estimates assume that relay upgrades are required for remote terminals at [Redacted] and [Redacted] Substation.
20. The CHSRA will be responsible for coordinating the installation of the protective relays for the new 115kV lines that will connect [Redacted] SS [Re] to the new 115kV [Redacted] Switching Station, as well as coordinating with PG&E for end-to-end testing of the circuit.

New 115kV Bakersfield ATF – 13 Loop Switching Station

Redundant connections are proposed to be provided by connecting into the existing [Redacted] 115kV Line, to allow for the interconnection of the [Redacted] SS [Re] in the Bakersfield area. A two – circuit breaker 115kV loop switching station is proposed to be built adjacent to the [Redacted] SS [Re] site, to facilitate the redundant connections into the 115kV Line. The [Redacted] 115kV Line is proposed to be looped into the new 115kV loop switching station via underground cables as a result of the limited space in the area. The approximate amount of land that will need to be acquired to facilitate the installation of the new 115kV loop switching station is approximately 0.84 acres (204' X 97').

Substation Work

1. Install new 2 – circuit breaker 115kV loop switching station based on specifications to be provided by PG&E and including all the required equipment and site work for a fully operational 115kV loop switching station. Total Costs: \$4.5M
 - a. Major outdoor equipment to be installed to support the new 115kV loop switching station installation includes the following:
 - i. Two (2) 115kV power circuit breakers, SF6 gas type, rated 121kV, 2000 amp continuous, 40kAIC, with two or three CTs (current transformers) as required on each bushing. (Note: the number of CTs shall conform to specific project protection requirements). Total Equipment Costs (including installation and testing): 2 X \$200k = \$400k
 - ii. (8) 115kV, 2000 amp, manually operated, air disconnect switches for circuit breaker isolation and line disconnect. Switches shall be mounted on dead end/pull off/switch support structures. Total Equipment Costs (including installation and testing): 8 X \$75k = \$600k
 - iii. (2) 115kV, 2000 amp, motor operated, air disconnect switches (MOAS) for bus isolation and station bypass. MOAS shall be mounted on low profile support structures. Total Equipment Costs (including installation and testing): 2 X \$100k = \$200k
 - iv. Eight (8) 115kV coupling capacitor type voltage transformers (CCVT's) for line and bus relaying, two (2) of the eight (8) CCVT units shall be furnished with carrier accessories. Total Equipment Costs (including installation and testing): 8 X \$40k = \$320k
 - v. Two (2) 115kV, 2000 amp, single frequency, wave traps with associated line tuner units for Pilot Protection (if required). Total Equipment Costs (including installation and testing): 2 X \$50k = \$100k
 - vi. One (1) control building. The control building shall be furnished complete with batteries, AC/DC power systems, protection relay panels, protection relays, SCADA, and telecommunication equipment and panels as required by the PG&E Protection, Automation, and IT Standards. Batteries shall be installed within an adjoining room in the control building. \$750k
2. Install two (2) complete underground cable termination structures with potheads and lightning arresters for termination of two (2) 115kV underground cables. Total Costs: \$500k

Automation Work

1. Install RTU and associated SCADA equipment in control building.

Telecommunication Work

1. Primary (A) and secondary (B) single-mode underground fiber-optic cables between the new 115kV Redacted Switching Station and the Redacted will be required.
2. Install and configure communication channels to support protection schemes, SCADA/Telemetry, and metering.

This report assumes that the line protection relays, currently protecting the existing Redacted 115kV Line at Redacted Substation, will be upgraded to be compatible with the new line protection relays to be installed at the new 115kV Redacted Switching Station.

Substation Work

1. Replace one (1) line protection package (currently protecting the Redacted 115kV Line) for protection of the new Redacted Sw. Station 115kV Line. The specific type of relays to be included in the line protection package shall be determined by the PG&E system protection engineer. Total Costs: \$600k

Automation Work

1. Wire alarm and indication points from protection relays and IEDs to the existing RTU.

Telecommunication Work

1. Install and configure communication channels to support protection schemes, SCADA/Telemetry, and metering.

PG&E [Redacted] **Substation**

This report assumes that the line protection relays, currently protecting the [Redacted] 115kV Line at [Redacted] Substation, will be upgraded to be compatible with the new line protection relays to be installed at the new 115kV [Redacted] Switching Station.

Substation Work

1. Replace one (1) line protection package (currently protecting the [Redacted] 115kV Line) for protection of the new [Redacted] Sw. Station 115kV Line. The specific type of relays to be included in the line protection package shall be determined by the PG&E system protection engineer. Total Costs: \$600k

Automation Work

1. Wire alarm and indication points from protection relays and IEDs to the existing RTU.

Telecommunication Work

1. Install and configure communication channels to support protection schemes, SCADA/Telemetry, and metering.

Transmission Line Scope

Redacted

Transmission Line Scope of Work

The installation of the new 115kV [Redacted] Switching Station, to be located near [Redacted] and which is required to energize [Redacted] in the Bakersfield area, will require modifications to existing 115kV transmission lines. As a result of the limited space in the area, the proposed plan is to loop the [Redacted] 115kV Line into the proposed 115kV loop switching station via 115kV underground cables.

Specifically, two (2) 115kV riser structures, using tubular steel poles (TSPs), will be placed near structure 2/17 of the [Redacted] 115kV Line to facilitate the transition between the underground section and overhead section of the 115kV line. Additionally, one (1) single circuit transmission line (SCTL) TSP is proposed to be added to the adjacent [Redacted] 115kV Line in the transmission line corridor to eliminate the possibility of clearance issues arising from the transmission line conductor movement envelopes (conductor blow out).

In addition to the transmission line work associated with the installation of the new 115kV loop switching station, approximately 6.3 miles of the existing [Redacted] 115kV Line will need to be reconducted between [Redacted] PP and the [Redacted] Jct., and 1.7 miles of the existing [Redacted] 115kV Line will need to be reconducted between [Redacted] Sw. Station and the [Redacted] to eliminate potential overloads.

PG&E Transmission Line Scope of Work – Total Cost: \$10,760,000

Equipment	Quantity	Cost	Total
Reconductor approximately 6.3 miles of the [Redacted] 115kV Line (double circuit, strung on one side, lattice steel tower construction)	6.3 mi.	\$1,040/mi.	\$6,552,000
Reconductor approximately 1.7 miles of the [Redacted] 115kV Line (double circuit, strung on both sides, lattice steel tower construction)	1.7 mi.	\$1,390,000/mi	\$2,363,000
Install two (2) 115kV riser structures	2	\$250,000/each	\$500,000
Install one (1) 115kV SCTL TSP (to prevent clearance issues from adjacent 115kV line)	1	\$120,000/each	\$120,000
Install 115kV underground cables	600 ft.	\$2,000/ft.	1,200,000
Modify existing transmission lines to accommodate loop	1	\$25,000/each	\$25,000
Transmission Line Scope of Work Total Cost			\$10,760,000.00

The transmission line estimate assumptions are:

- The GC Line and GC Tower groups did not have any input on this scope or estimate. It was assumed that no construction issues will significantly impact the project or estimate.
- This cost estimate does not have costs associated with environmental studies, permitting, TES, biological costs, or land or right-of-way acquisitions.
- This cost estimate assumes that soil conditions allow the use of PG&E standard auger-type foundations. The estimate does not include any geotechnical investigation costs.
- This cost estimate does not include the handling or disposal of hazardous material or soil contamination at the site locations.
- This cost estimate assumes adequate space will be available for construction activities.
- This cost estimate does not include site survey costs.