

SSPG Ten-Year Transmission Plan

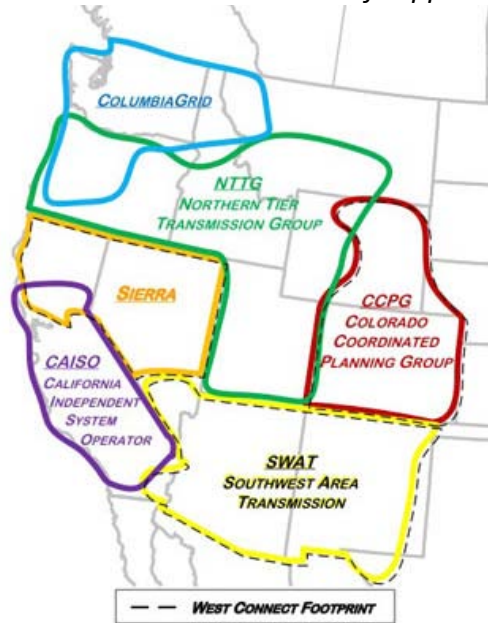
2011 - 2020

A Report Detailing the
Electrical Transmission System Expansion Plan
Within the Sierra Subregional Planning Area
During 2011-2020



The Sierra Subregional Planning Group (SSPG) subregional planning group is a collaborative study group that has been created to meet the following purpose:

To provide an open and collaborative forum where interested parties are encouraged to participate in the planning, coordination, and implementation of a robust transmission system in northern California and northern Nevada. The open stakeholder participation envisioned in this process are intended to result in transmission expansion plans that meet a variety of needs and have a broad basis of support.



The figure above shows the footprint of the SSPG in relation to the other WestConnect Transmission Planning Groups as well as regional planning groups of California and the Northwest. Member utilities of SSPG include but are not limited to, NV Energy, Western Area Power Administration, Sacramento Municipal Utility District (SMUD), Transmission Agency of Northern California (TANC), Lassen Municipal Utility District (LMUD). The Sierra Sub regional Planning Group (SSPG) has been formed for over two years and is completing its first stakeholder requested regional transmission interconnection, reliability and economic studies. The SSPG studies a joint, high voltage transmission system planning forum for the purpose of assuring a high degree of reliability in the planning, development and operation of the high voltage transmission system in the northern Nevada and northern California or SSPG Region. This is in accordance with the Joint Transmission Access Principles and the Electric Transmission Service Policy Statement, dated Dec. 16, 1991.

The SSPG provides the technical forum required to complete reliability assessments, develop joint business opportunities and accomplish coordinated planning, under the single-system planning concept in the SSPG region of the Western Electricity Coordinating Council.

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Study Requests 2011

The Sierra Sub-Regional Planning Group (“SSPG”) requested that the Western Electricity Coordinating Council (WECC) conduct the following transmission expansion studies as part of the Transmission Expansion Planning Policy Committee’s (TEPPC) 2011 Study Program.

TEPPC is developing a reference case or base case as a starting point for analyzing different scenarios. The SSPG requested that WECC study three specific scenarios in order to determine the differential cost of each scenario relative to the base case. This will provide insight into the viability of the proposed projects and their performance relative to other previously proposed projects. The three scenarios requested by SSPG are as follows:

- (1) 1000 MW Lassen Municipal Utility District (“LMUD”) trans-Sierra tie line with full renewable energy capacity subscription

The LMUD tie will consist of two 400 MVA 345 kV phase shifting transformers in parallel located at an NV Energy substation named Shaffer. NV Energy will own and operate the phase shifters. Adjacent to Shaffer, LMUD will construct the Viewland 230 kV substation. The Viewland substation will contain two step down 345/230 kV auto transformers. A 50 mile 230 kV double bundled double circuit transmission line will connect the Viewland 230 kV substation near Susanville California to an LMUD substation at Westwood. The LMUD tie will continue on from Westwood to the Western 230 kV substations at Olinda and Cottonwood, each about 70-80 miles total length from Westwood, and located in the Balancing Agency of Northern California BA.

- (2) 1000 MW Great Basin HVDC trans-Sierra tie line with full renewable energy capacity subscription, and

The GB HVDC project connects at Tracy 345 kV in the NV Energy northern system. The western terminus of the GB HVDC is located at a new 500/230-kV substation in the proximity of the Western Area Power Administration (Western) O’Banion Substation and will be in the CAISO balancing area. The GB HVDC line will connect via an underground cable approximately 150 miles in length to the AC to DC converter stations at each terminus identified.

- (3) 2000 MW trans-Sierra capability (combination of Scenarios #1 and #2) with 80% renewable subscription and 20% economic dispatch capacity.

The SSPG Committee continues to provide TEPPC with more detailed assumptions and information during the study cycle to model these scenarios. This analysis should produce a least cost view of resource and transmission investments over the relevant planning horizon. Due to the high capacity factors of renewable energy in Northern Nevada, the short distances

between generators and end-users, the project “right sizing” to allow an expedited in-service date, and the use of existing corridors and/or innovative transmission technologies to facilitate permitting, any of the three scenarios are likely to be highly competitive with other larger scope projects that SSPG and others have requested TEPPC to investigate in their 2010 and 2011 study programs.

Conclusions

For the purposes of these studies the existing Valmy Tracy 345 kV lines would be folded into an Oreana 345 kV substation for the collection of renewables. The Oreana substation is about halfway along the two existing Tracy to Valmy 345 kV lines. Both project studies are filed separately under WestConnect\SSPG. In general the most severe outages influence COI but only in the 5-10% range under (n-1) and (n-2) emergency conditions with no NERC voltage violations or facility ratings violations.

LMUD

The LMUD tie would be limited to approximately 500 MW from Sierra without the Tracy-Viewland 345 kV line addition. The Tracy-Viewland 345 kV line would connect the Tracy generating station about 10 miles east of Reno NV with the Alturas 345 kV line about 18 miles northeast of Susanville California. Reactive support is needed in the form of a second 52 MVAR cap at Hilltop and at placements along the LMUD line, for example, at Westwood. For scenarios where a third of the renewables for the LMUD tie are injected at Westwood and total exports from NV Energy north are in the 500 to 600 MW range, the renewable sources at Westwood would supply the necessary reactive support required at Westwood. No adverse transient stability system impacts were found when the power flow scenarios were studied in time domain.

With the addition of the Tracy-Viewland 345 kV line, the LMUD tie could operate in a range of 800 MW or more with the (n-2) Contingencies studied having significant influences on parallel paths such as COI, but within easily adjustable operating limits.

GB HVDC

No pre-contingency negative impacts were seen in the NV Energy northern system from the addition of the GB HVDC tie line. The GB HVDC project would require some reactive power coordination or additions at Hilltop and along Alturas to regulate the Alturas voltage depending on system configuration at the time of project construction.

The GB HVDC project would be required to be integrated into a Remedial Action Scheme (RAS) to trip or adjust the phase shifters at Alturas and Cal Sub in the NV Energy system and drop excess generation where necessary. It is expected that the HVDC technology would be quite

well suited to be integrated into such a scheme. In some instances the COI 4800 MW study-flow was exceeded by more than 200 MW. This represents less than a five percent delta to the line flow and could easily be remediated by re-dispatch and phase shifter adjustments.

No adverse transient stability system impacts were found in the scenarios studied in power flows that were also studied in time domain. The most severe contingencies were the (n-2) loss of the Tracy-Oreana, (n-1) loss of the One-Nevada ON-Line from the NV Energy northern system to the NV Energy southern system and the credible (n-) loss of the GB HVDC tie itself

Combined Studies

SSPG studied Case 1 LMUD Path and Case 2 GB HVDC Path as part of its 2011 sub-regional planning study requirement under Attachment K. Each case was studied individually as a Trans-Sierra path at 1000 MW of capacity. In addition SSPG requested TEPPC to study both as a combined 2000 MW scenario. In the combined case for an (n-2) contingency of either LMUD or GB HVDC, the power flow increases to COI are similar to those found in the individual cases.

An (n-2) outage of the LMUD Path will cause flow to transfer to the remaining WECC interchange paths. The GB HVDC facilities maintain their pre contingency schedule. The LMUD (n-2) results in a slightly higher increase in COI flow compared to the GB HVDC path (n-2) and a reduction in the Alturas import for a given scenario of about 50 %. This also shows that the LMUD interconnection is using a portion of the Alturas path rating, affects the ability of the Alturas phase shifter to use its full range of taps for import during periods of heavy renewable export to LMUD from Sierra.

An (n-2) outage of The GB HVDC will increase the flow on the LMUD path as well as increasing flows on COI via the remaining WECC interchange paths. The flows on the LMUD path are high in the range of 1000 MW from Viewland to Westwood and nearly 1175 MW for west of Westwood. Generator dropping at Westwood along with re-dispatch as expected in the singular cases would again be used as part of a remediation to reduce COI flow.

The (n-2) of Tracy-Oreana overloads the Alturas phase shifter but causes only minor increases to COI, less than 2.5 %. Subsequently unloading Alturas will shift power flow back to COI, but as in all of the scenarios. Large scale generation dispatch would be required between NV Energy, BANC and CAISO.

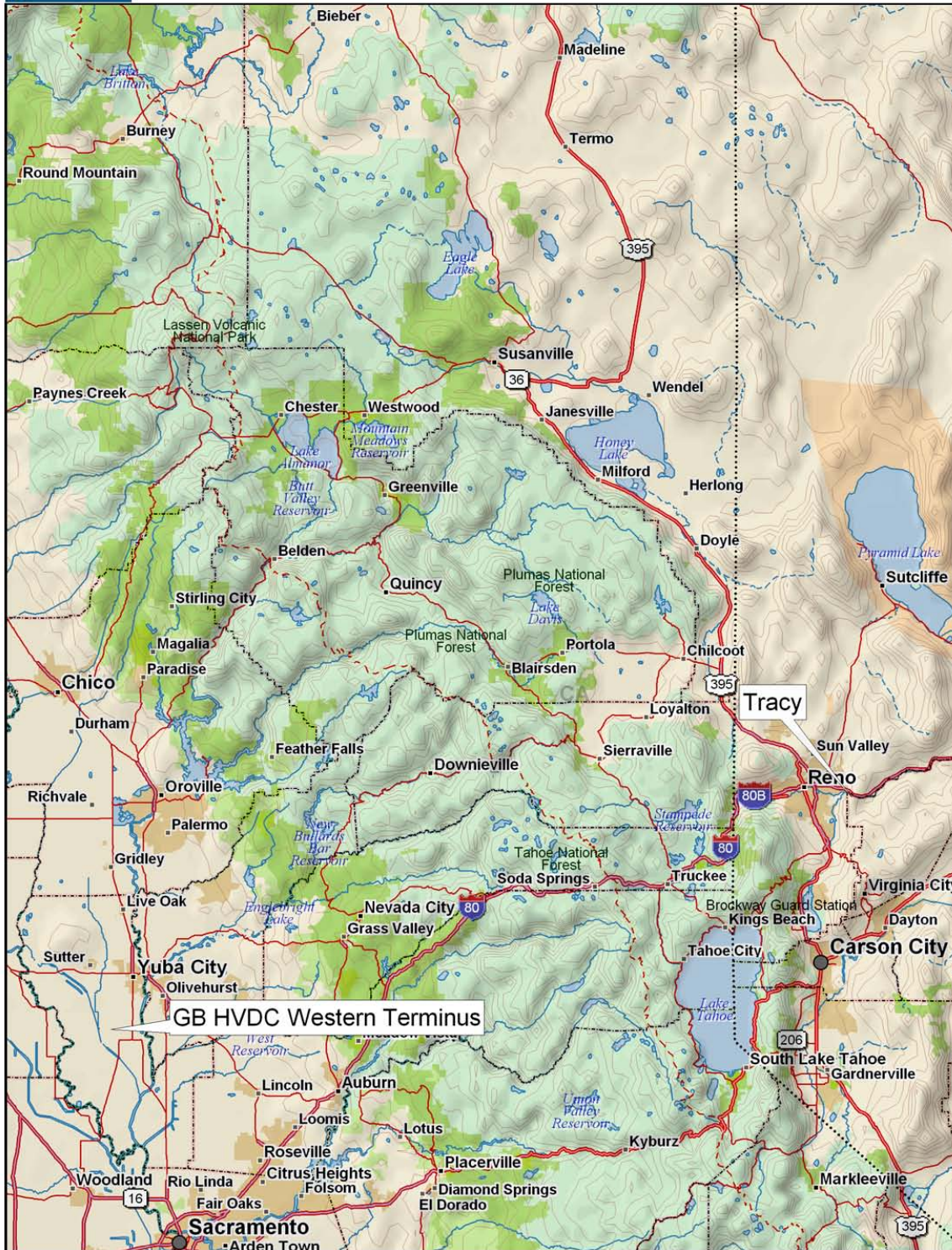
The outage of ON-Line causes an increase in COI of around 5%. The Alturas phase shifter does not overload and an increase across the LMUD path does occur but is somewhat less than the Tracy-Oreana (n-2) at 1050 MW total west of Westwood.

The results of both studies by themselves indicated that much closer coordination would be required between SSPG and PG&E. This would be best accomplished by coordination between SSPG and CTPG but more so with PG&E through a WECC three phase rating process. Only a

fraction of the reliability studies for the individual cases might apply to the combined case in order to reveal any additional results without knowing what specific facility upgrades and additions would be required in the PG&E balancing area.

The individual studies indicated very specifically what would be required in the NV Energy northern system. For example, the LMUD Path would require the Tracy-Viewland 345 kV line addition. The GB HVDC project does not require this addition. As both the LMUD and GB HVDC project going forward may have less likely-hood than either case going foreword by itself. The joint case reliability study exercise would not reveal any significantly different results for the individual cases. However; due to the modeling approach and the capacity benefit, it is still beneficial for TEPPC to incorporate each project by themselves and as a combined project to measure any economies of scale. Such results are expected in economic studies and not necessary in reliability based studies without more specific knowledge about the PG&E system and its expected upgrades.

Project Maps



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GB HVDC Project Locations

Member Project Updates

SMUD

New Transmission Projects

1. O'Banion – Elverta/Natomas 230 kV Double Circuit Line
 - Joint Project with WAPA
 - In Service May 2011
2. 230 kV Shunt Capacitor at Natomas (50 MVAR)
 - In service May 2011

Proposed Transmission Projects 2011-2020

1. 200 MVAR 230 kV Shunt Caps
2. Power Factor Improvement Program
3. Iowa Hill Pumped Storage Plant (400 MW)

Western

New Transmission Projects 2011-2020

1. Upgrade Tracy Substation to DBDB Configuration
 - a. Scheduled completion – last quarter 2012
2. Reconductor Shasta-Flanagan-Keswick 230 kV line
 - a. Scheduled completion – June 2014

Proposed Transmission Projects 2011-2020

1. Convert Sutter – O'Banion 230 kV Line from Single to Double Circuit
2. Fiber Optic addition to Hedge – Tracy 230 kV line
3. Reconductor Elverta – Tracy 230 kV line

NV Energy

New Transmission 2011

1. 230 kV Shunt Reactors [In Service Early Spring 2011]
2. Harry Allen 345/230 kV Transformer Bank 2 [In Service May 2011]

Under Construction 2011

1. 235-mile 500 kV transmission line Robinson-Harry Allen
2. Robinson Summit 500/345 kV substation
3. Falcon-Gonder Fold
4. Add 70% series compensation: 35% at Falcon and 35% at Robinson
5. Harry Allen Terminal

Total Project estimate \$509.6M

1. \$14.7M in 2010
2. \$217.6M in 2011
3. \$262.5M in 2012

Proposed 2011-2020

1. Harry Allen 500/230 kV Transformer Bank 1 [2015]

Filed as Transmission Corridor Project TCP under the WECC Portal

1. Harry Allen – Northwest 500 kV Line Permitting
2. Northwest - Amargosa 500 & 230 kV Permitting
3. Harry Allen – El Dorado 500 kV Line Permitting