

Public Service Company of New Mexico
New Mexico Wind Expansion Options and HPX Integration
DRAFT STUDY SCOPE

Introduction

This study plan proposes analysis which investigates integrating the conceptual wind expansion options developed under the SWAT New Mexico subgroup in 2007 and the proposed High-Plains Express Project (HPX). The studies will look at impacts on transfer capabilities identified in the HPX feasibility study for transfers in and through New Mexico.

The primary objectives include 1) assessing the potential to phase portions of HPX to improve near term economics, 2) determine how best to integrate with the existing 345 kV systems in New Mexico while maximizing long-term transfer capability and 3) perform limited analysis on expanding the collector concepts for potential resources in areas of Northeastern and Southeastern New Mexico. All results are limited to high level feasibility through powerflow analysis.

Assumptions and data from the HPX Feasibility Study effort and wind collector studies will be used in guiding this effort. Analysis is limited to the New Mexico system. It is assumed that integration in New Mexico will not impact HPX benefits in other states.

The proposed HPX project is conceptually shown in Fig 1. (The report for the HPX feasibility study is currently expected to be completed in March, 2008.) For purposes of this integration study, a system transfer capability of 3000 MW(?) will be used as the starting reference for the HPX project.

Fig 2 includes a diagram of integrating the conceptual NM wind collector system with the system reviewed in the HPX study. This effectively replaces part of the proposed 500 kV HPX project in New Mexico with the proposed 345 kV collector system. Analysis will focus on defining impacts to transfer capability and possible variations that would maintain the highest transfer levels.

Fig 3 shows potential expansion of the NM collector system to accommodate resources in northeastern and southeastern NM. This diagram also shows a potential to reduce the HPX project scope in southern New Mexico by including the Sunzia project and connecting with EPE's existing 345 kV transmission system in southeastern New Mexico. (Do we want to include this in the analysis?)

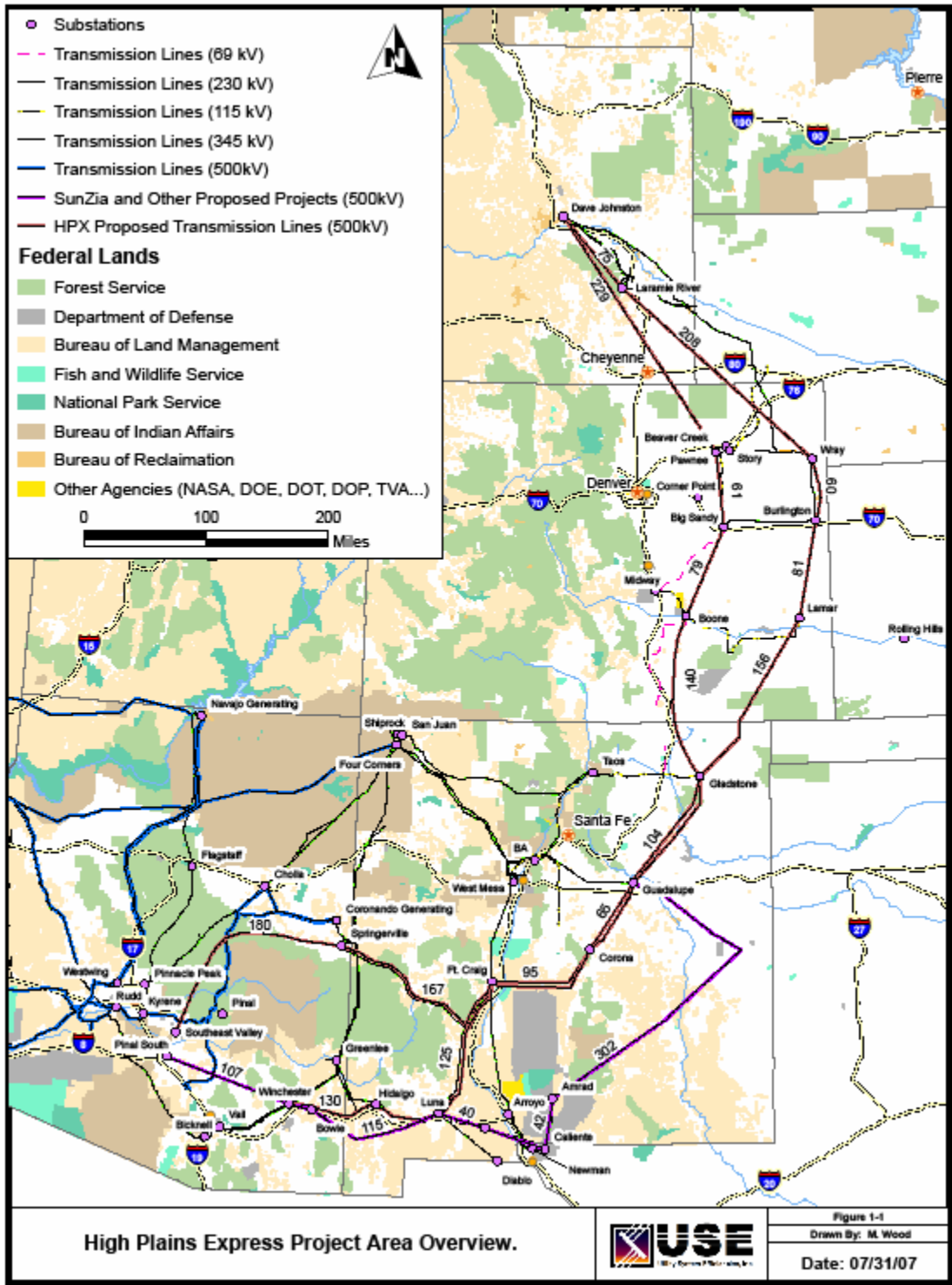


Figure 1

(Source: http://www.rmao.com/wtpp/HPX/HPX_Stakeholder_111407.pdf Page 23)

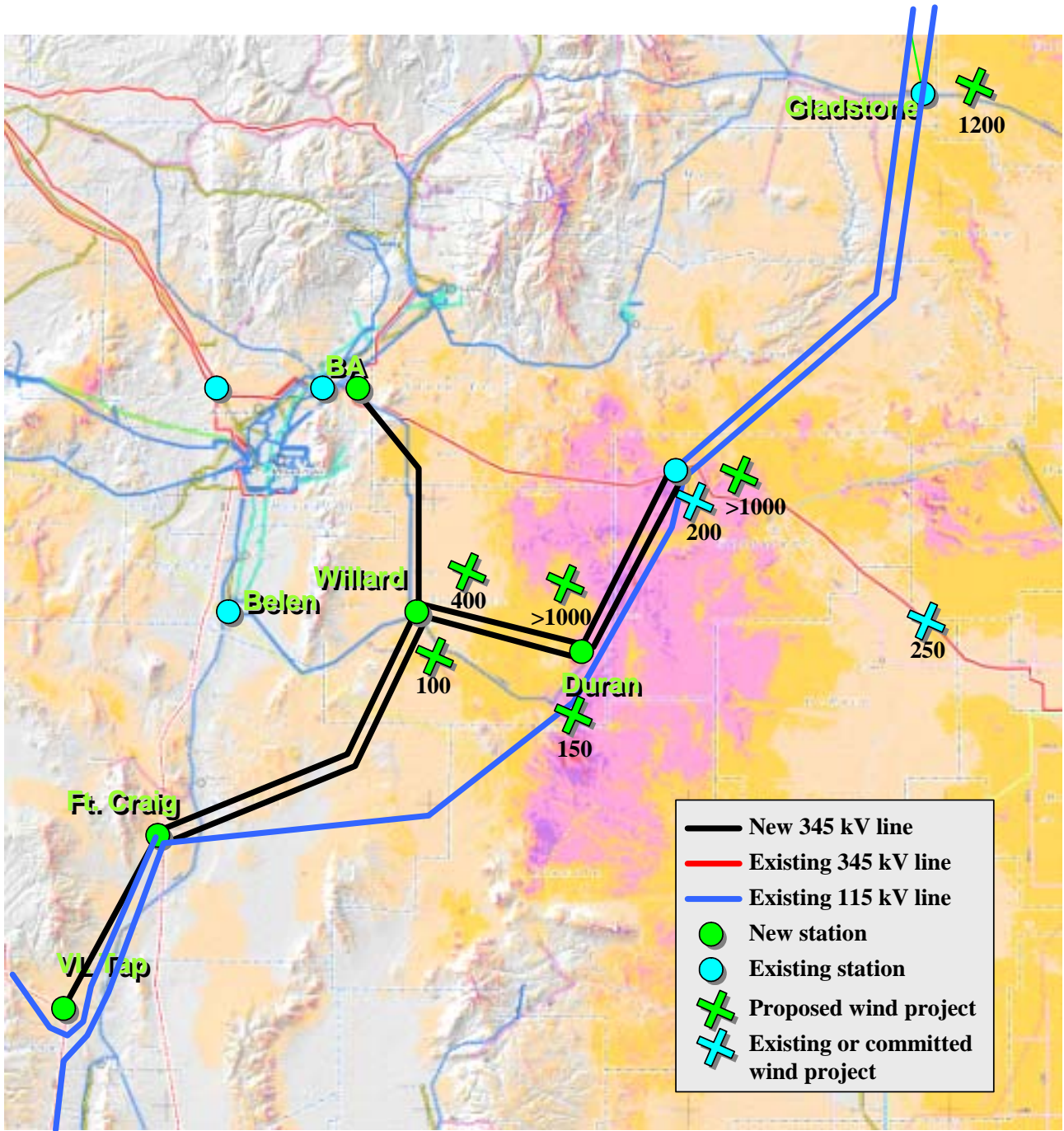


Figure 2 - Conceptual Integration of collector system and HPX

Proposed Expanded Collector Integration

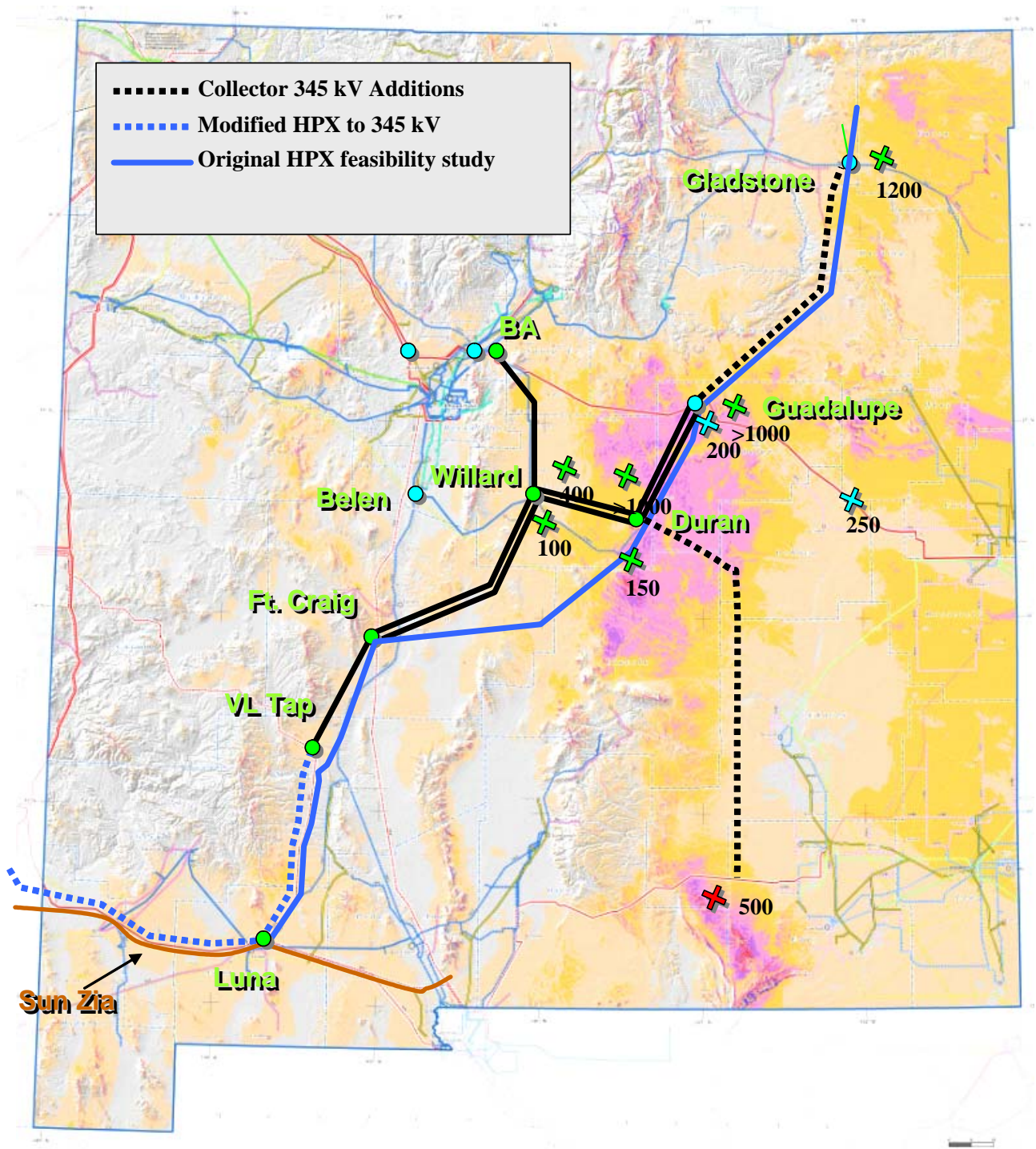


Figure 3 - Collector Expansion into northeastern and southeastern New Mexico

Integration Alternatives

The wind collector system in New Mexico was used to assess facilities that could accommodate wind interconnections up to approximately 3000 MW beyond the amount currently interconnected with existing transmission lines. The study did not assess needs beyond the boundaries of PNM's system. The HPX study focused on transfer scenarios both through New Mexico and with New Mexico resources taken beyond the New Mexico border and into Arizona. The proposed transfer options for this analysis include:

1. Base scenario includes replacing one 500 kV branch of HPX with wind collector system as shown in Fig 2. Review 1500 MW carried into and through New Mexico along with 1500 MW of new generation resources (mostly wind) connected to the NM 345 kV collector system in central NM.
2. Review collector system with one 345 kV line from Guadalupe to Gladstone added. Wind resources connected to the Gladstone 345 kV bus will be assumed. Approximately xxx MW will be modeled at Gladstone instead of central New Mexico.
3. Review collector system with a 345 kV tie from southeast New Mexico to the Willard/Duran area. Approximately xxx MW will be modeled connected in southeastern NM instead of central New Mexico. (Do we want to tie this into Amrad or the Amrad-Artesia line?)

(Are there loading sensitivities that need to be considered like low load and high wind?)

(May need to clarify a scenario that is a combination of 1, 2 and 3 is needed)

Methodology and Assumptions

1. The studies are limited to powerflow analysis. No transient or voltage stability, or short circuit studies will be performed. System performance will be evaluated based on system intact (N-0) and single contingency (N-1) conditions.
2. Study Base Case: It is proposed that a case with 3000 MW of transfers from the HPX studies be utilized as a starting point. The New Mexico system and HPX will be modified to include the wind collector system as shown in Fig 2. The HPX study case was initially built by HPX participants in mid-2007 to represent a 2017 HS system. (We should discuss whether the planned Westconnect 2018 HS case currently under development will be a better starting case for the purpose of this analysis. Will the case include HPX and Sunzia and other significant bulk system modifications?)
3. Reactive compensation requirements will be discussed in general terms.
4. Series compensation for the HPX project will be assumed to be 70% unless changes are warranted to obtain necessary system performance. (Series compensation was not previously included with the wind expansion options, however, this may need to be revisited with the system in parallel with the HPX project and examined beyond the boundaries of PNM's system.)
5. The following planned transmission projects will be included:
 - a. PNM's Rio Puerco Stage 2 project was assumed in service. This includes a new 345 kV station at Rio Puerco, looping the existing San Juan – BA and BA –West Mesa 345 kV lines, and a new 345/115 kV transformer at Rio Puerco.
 - b. Any others? Sunzia?

(If the Westconnect base case is utilized, the projects modeled should largely be addressed in building the case).

6. Wind resources on the BB line that are in-service or have executed interconnection agreements will be dispatched at full output (454 MW as of January 2008). The Blackwater HVDC converter will be scheduled at 200 MW westbound.
7. The existing Arroyo PST will be set to control flow north to south at 201 MW. Sensitivity studies will be conducted with the Arroyo PST bypassed.
8. New Mexico generation will be dispatched per the base case. (need to discuss).
9. Transmission system upgrades may be added to maintain acceptable N-1 system performance with respect to facility flow ratings.
10. In addition to outages of each of the new lines added to the base case and corresponding new line segments on existing lines, the following contingencies will be evaluated:
 - a. Four Corners – Rio Puerco 345 kV
 - b. San Juan – Rio Puerco 345 kV
 - c. West Mesa – Arroyo 345 kV
 - d. Greenlee – Hidalgo 345 kV
 - e. Springerville – Luna 345 kV
 - f. BA – Guadalupe 345 kV
 - g. Others
11. Only thermal (temperature/sag) emergency ratings will be considered in the contingency analysis. Transmission upgrades required to mitigate voltage, short circuit and transient stability issues were not studied. Potential voltage problems will be flagged. All costs shown in this document are, therefore, preliminary.
12. Southern New Mexico Interface (SNMI) level will be per the base case.
13. Incremental generation in New Mexico will be displaced throughout the Southwest. System impacts and transmission constraints beyond the New Mexico system will not be assessed.
14. Generation, PST schedule and path flow combinations that were not considered in this study have the potential to cause other transmission system constraints.
15. Transmission development Stages consist of the transmission system expansion scenario that would generally result in lowest overall cost for a certain level of incremental generation. Any potential transmission development stages that are identified could occur in a different order or magnitude depending on generation commitments and in-service dates.
16. This study does not address feasibility, interconnection cost, or cost allocation for any particular proposed generation project. Such determinations can only be made in the context of interconnection studies pursuant to the most current OATT that PNM has filed with FERC.
17. The following Paths will be monitored: Path 47, Path 48, Others?
18. Refinements to the assumptions and additional transmission expansion options may be included in the study, as needed.
19. Contingency performance criteria in New Mexico for this analysis is contain as Attachment 1.

Study Schedule and Contact Information

PNM's Transmission Operations will conduct the majority of the study in accordance with the study plan with input and participation from members of the SWAT New Mexico subgroup. It is anticipated that the study will be completed by November 2008 with draft results by the August SWAT meeting. Any questions or comments regarding this study should be directed to the contact below.

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Attachment 1 (check on latest)
Performance Criteria

1. All buses, lines, and transformers in New Mexico operating at voltages of 46 kV and above will be monitored.
 - Post contingency element loadings will only be tabulated if they increased more than 1% from the normal system loading. To clarify, if an element was overloaded in the normal condition and increased no more than 1% in the outage condition, the overload will not be reported.
 - Post contingency voltage violations will be tabulated only if they deviate by more than 0.005 p.u. from the normal system voltage. To clarify, if a bus had a low voltage violation in the normal condition and decreased by no more than 0.005 p.u. in the outage condition, the bus will not be reported.
2. Each option will be tested against NERC/WECC reliability criteria and additions/exceptions as listed in the following table:

Area	Conditions	Loading Limit	Voltage (p.u.)	Voltage Drop	Comments
EPE	Normal	< Normal Rating	0.95 - 1.05		69kV and above
			0.95 - 1.10		Artesia 345 kV
			0.95 - 1.08		Arroyo 345 kV PST source side
			0.90 - 1.05		Alamo, Sierra Blanca & Van Horn 69kV
	Contingency	< Emergency Rating	0.925 - 1.05	7%	60 kV to 115 kV
			0.95 - 1.10	7%	Artesia 345kV
			0.95 - 1.08	7%	Arroyo 345kV PST source side
			0.90 - 1.05		Alamo, Sierra Blanca & Van Horn 69kV
			0.95 - 1.05	7%	Hidalgo, Luna, or other 345 kV buses
PNM	Normal	< Normal Rating	0.95 - 1.05		Above 46 kV with ALIS
	Contingency	< Emergency Rating	0.90 - 1.05	6% 7%	46 kV and above Deming area only
Tri-State	Normal	< Normal Rating	0.95 - 1.05		All voltages with ALIS
	Contingency	< Emergency Rating	0.90 - 1.10	6% 8%	Buses adjacent to PNM system. Buses not adjacent to PNM system