DRAFT STUDY PLAN FOR 2015

Introduction

The Ten-year transmission planning process is intended to facilitate a timely, coordinated and transparent process that fosters the development of electric infrastructure that both maintains reliability and meets load growth so that PNM can provide reliable and cost-effective service to all transmission customers (native, network and point-to-point).

PNM will conduct these studies to ensure that all North American Electric Reliability Corporation ("NERC"), Western Electricity Coordinating Council ("WECC") and local reliability standards are met for each year of the ten-year planning horizon, for planned loads and resources. These reliability studies will be coordinated with the other regional transmission planning organizations through joint efforts and SWAT workgroups where applicable.

This assessment will concentrate on 10-year peak summer and winter load conditions (specifically for years 2017, 2020, 2025) and one off-peak load condition as described in Appendix A.

Study Scope

- Review transmission adequacy with network customer updates to designated network resources and load.
- Determine if new system mitigations or adjustment to existing mitigations are needed to serve expected obligations (load forecasts and expected firm transfers) during the 10 year planning horizon without violating WECC/NERC reliability standards.
- Develop operational mitigations or system improvements to maintain system reliability and associated cost estimates and schedule.
- Incorporate assessments of economic congestion to the extent a need is identified by PNM's or other's involvement in the WECC/TEPPC process for providing this type of assessment.

Planning Methodology/Criteria

PNM uses a deterministic approach for transmission system planning. Under this approach, system performance should meet certain criteria under normal conditions (all lines in service) and for outage conditions (element(s) out of service). PNM considers the following contingencies in its assessment of the transmission system.

- Single contingencies: Assessment identifying system impacts when a single branch is removed from service. All branches within PNM's control area and adjacent branches in any control area with which PNM has interconnections are studied.
- Double circuit contingencies - Outages where an event of sufficient risk causes the loss of two branches. For PNM's system, this exposure is limited to certain double circuit scenarios and a circuit initially out-of-service followed by loss of another circuit.
- Breaker failure contingencies - Breaker failure operation involves the loss of two or more elements at a station.

The planning methodologies and assumptions described below are used as the basis for the development of future transmission facilities. As an alternative to system reinforcements for N-2 and breaker failure outages, it may be more cost-effective to implement a re-dispatch protocol and/or remedial action scheme (generator tripping or load dropping) considering the low probability of occurrence of these types of outages.

Assumptions

- Committed projects identified in the prior ten-year assessment will be modeled in the base cases. These projects are listed in Appendix B. Committed projects may be reviewed during the study to determine if timing or other adjustments are needed.

- Use utility load forecasts for 1 in 2 load probability (a probability of 50% not to exceed the target load peak).

- Generation projects will be modeled if they are in service, under contract or in construction. Expected dispatch levels will be modeled for all generation.

- Load-side generation will be dispatched as required to serve load and maintain positive margin on Path 48.

- Wind Resources: The assumption for peak load conditions is that little wind generation will be available due to lack of wind (which matches historical conditions). Wind sensitivity cases will be run with wind dispatched and appropriate redispatch of other resources to meet the same load level for the off-peak case.

Methodology

Outage performance is assessed with power flow simulations using the methodologies listed below to reflect the system response to an outage before operator intervention.

- All manually operated voltage control and phase shifting devices will be fixed.
- All load-side resources are operated such that the pre-disturbance MVAr output is minimized while maintaining normal system voltage levels.
- All generators which control a high side remote bus will be set at the pre-disturbance voltage at the terminal bus except for generators/SVC that have line drop compensation.
- The load-side generation/SVC pre-outage reactive limits will be changed from their minimum MVAr limit to their corresponding MVAr limit as defined on their capability curves. Their corresponding voltage schedule will be changed to match the actual solved pre-outage voltage.

Short Circuit studies will be performed to determine if breaker interrupt ratings are exceeded when resource additions or transmission modifications could significantly increase fault current.

Modifications to the bulk transmission system will be reviewed for compliance with dynamic and voltage stability criteria through power flow and transient stability simulations.

Improvements suggested by stakeholders will be evaluated, where applicable, to address violations identified in the analysis. Suggested improvements are noted in Appendix A.

Criteria

PNM adheres to the following National Electric Reliability Council (NERC)/WECC Planning Standards[1] with a few exceptions as noted below.

The criteria from applicable NERC/WECC standards are listed below:

- Changes in bus voltages from pre- to post-contingency must be less than 5% and 10% for single and double contingencies, respectively.

- All equipment loadings must be below their normal ratings under normal conditions.

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[1] This document is accessible through the Internet at *http://www.wecc.biz*.

- All line loadings must be below their emergency ratings for both single and credible double contingencies. All transformers and equipment with emergency rating should be below their emergency rating.

- Stability is divided into two categories, which include 1) transient or dynamic stability, and 2) steady-state voltage stability (P-V and Q-V Analysis). The operating criteria for each of the performance criteria are discussed below.

  - The transient stability criteria require that all machines remain in synchronism, all voltage swings should be damped, and voltage/frequency performance must meet the following performance criteria:
    - Following fault clearing for single contingencies, voltage on load buses may not dip more than 25% of the pre-fault voltage or dip more than 20% of the pre-fault voltage for more than 20 cycles.
    - For double contingencies (i.e., breaker failures), voltage on load buses may not dip more than 30% of the pre-fault voltage or dip more than 20% of the pre-fault voltage for more than 40 cycles.

  - Voltage stability criteria requires: "The most reactive deficient bus must have adequate reactive power margin for the worst single contingency to satisfy either of the following conditions for n-1 outages, whichever is worse: (i) a 5% increase beyond maximum forecasted loads or (ii) a 5% increase beyond maximum allowable interface flows. The worst single contingency is one that causes the largest decrease in the reactive power margin." For double contingencies (i.e., breaker failures) the reactive margin is reduced to 2.5%.

Listed below are additions and exceptions to the WECC reliability criteria for PNM's control area.

- For voltage levels between 46 kV and 345 kV, the minimum and maximum are 0.925 p.u. and 1.08 p.u., respectively, for N-1 contingencies. For N-2 and breaker failures the minimum voltage level is 0.90 p.u. and the maximum voltage level is 1.08. p.u.

- Voltage drop for bus voltages between 46 kV and 345 kV from pre- to post-contingency must be no greater than 6% at buses within the northern New Mexico system. Voltage drop for bus voltages between 46 kV and 345 kV from pre- to post-contingency must be no greater than 7% at buses within the southern New Mexico system. PNM allows no greater than a 10% voltage drop for bus voltages between 46 kV and 345 kV from pre- to post-contingency for N-2 and breaker failures outages.

- The maximum steady state voltage and transient swing voltages for the Blackwater-BA 345 kV line are 1.1 p.u. and 1.2 p.u., respectively. However, the steady state voltage level on the BA 345 kV bus and Blackwater 345 kV bus must be 1.05 p.u. or less.

Tri-State's additional criteria for contingencies are listed below:

- The minimum and maximum bus voltages for normal operation are 0.95 p.u. to 1.05 p.u., respectively.

- The minimum and maximum bus voltages for outage conditions are 0.90 p.u. to 1.10 p.u., respectively.

- Changes in bus voltages from pre- to post-contingency must be less than 6% for Tri-State buses in Northern New Mexico except Northeastern New Mexico. Changes in bus voltages from pre- to post-contingency must be less than 7% for Tri-State buses in Northeastern New Mexico and Southern New Mexico. Tri-State allows no greater than a 10% voltage drop for N-2 and breaker failures outages.

LAC's additional criteria for contingencies are listed below:

- The 115 kV voltages within Los Alamos service territory are to be greater than 0.925 p.u. Voltage drops within the Los Alamos Service territory are not to exceed 6.0% at the 13.8 kV level.

Appendix A
Base Case Development

2017 Peak Summer Base Case

WECC Base Case: 2015 HS4-OP

Projects to be included:
1. Richmond Switching Station
2. Rio Puerco 345 kV Addition
3. Rio Puerco SVC
4. Second Yah-Ta-Hey 345/115 kV Transformer
5. Alamogordo Replacement Capacitor Installation

2017 Peak Winter Base Case

WECC Base Case: 2015-16 HW3-OP

Projects to be included:
1. Richmond Switching Station
2. Rio Puerco 345 kV Addition
3. Rio Puerco SVC
4. Second Yah-Ta-Hey 345/115 kV Transformer
5. Alamogordo Replacement Capacitor Installation

2017 Off Peak Case

WECC Base Case: 2015-16 LW1-OP

Projects to be included:
1. Richmond Switching Station
2. Rio Puerco 345 kV Addition
3. Rio Puerco SVC
4. Second Yah-Ta-Hey 345/115 kV Transformer
5. Alamogordo Replacement Capacitor Installation
6. Second Yah-Ta-Hey 345/115 kV Transformer

2020 Peak Summer Base Case

WECC Base Case: 2020 HS2

Projects to be included:
1. Richmond Switching Station
2. Rio Puerco 345 kV Addition

3. Rio Puerco SVC
4. Second Yah-Ta-Hey 345/115 kV Transformer
5. Alamogordo Replacement Capacitor Installation
6. Alamogordo Voltage Support Phase 2

2020 Peak Winter Base Case

WECC Base Case: 2019-20 HW1

Projects to be included:
1. Richmond Switching Station
2. Rio Puerco 345 kV Addition
3. Rio Puerco SVC
4. Second Yah-Ta-Hey 345/115 kV Transformer
5. Alamogordo Replacement Capacitor Installation
6. Alamogordo Voltage Support Phase 2

2025 Peak Summer Base Case

WECC Base Case: 2025 HS1

Projects to be included:
1. Richmond Switching Station
2. Rio Puerco 345 kV Addition
3. Rio Puerco SVC
4. Second Yah-Ta-Hey 345/115 kV Transformer
5. Alamogordo Replacement Capacitor Installation
6. Alamogordo Voltage Support Phase 2

2025 Peak Winter Base Case

WECC Base Case: 2024-25 HW1

Projects to be included:
1. Richmond Switching Station
2. Rio Puerco 345 kV Addition
3. Rio Puerco SVC
4. Second Yah-Ta-Hey 345/115 kV Transformer
5. Alamogordo Replacement Capacitor Installation
6. Alamogordo Voltage Support Phase 2

PNM Resource Additions:

Based on 2014 IRP outcome.

Appendix B
Study Timeline

The projected milestones and timetable to meet the overall schedule for the 2014 Study Plan is as follows:

February 19, 2015	Draft Study Plan distributed to stakeholders
March 1, 2015	Network Customer ten-year projected network load and network resources are due to PNM
March 5, 2015	Stakeholder Meeting to discuss study plan
March 20, 2015	Finalize detailed Study Plan
March 30, 2015	Finalized base cases and contingency files.
April 30, 2015	Contingency runs completed and required improvements identified
May 31, 2015	Projects descriptions and one-line diagrams completed to determine cost estimates
July 31, 2015	Transient stability and sensitivity analyses completed
	Finalize project descriptions and cost estimates
	Contingency analysis with new projects completed
August 31, 2015	SWAT meeting with preliminary discussion of draft utility plans to be included in SWAT Planning Report.
October 2015	Incorporate with Annual SWAT/WestConnect Report
November 5, 2015	Stakeholder meeting to review transmission plan and follow-up for next study cycle.
November 2015	SWAT meeting with SWAT Planning Report Review