Planning Criteria Document				
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TABLE OF CONTENTS:

1.0 PURPOSE 3
2.0 SCOPE 3
3.0 RESPONSIBILITIES 3
4.0 APPLICABILITY 3
5.0 DEFINITIONS 5
6.0 SYSTEM PLANNING PERFORMANCE STANDARDS 6
6.1 Powerflow Studies (Steady State) 6
6.2 Short Circuit Evaluation 8
6.3 Stability Studies 8
6.4 Defining System Instability 9
6.5 Special Protection Systems (Remedial Action Schemes) 10
7.0 REVIEW & APPROVAL INTERVALS 10
8.0 DOCUMENT CONTROL 10
9.0 RETENTION PERIOD 10
10.0 REFERENCE DOCUMENTS 11
REVISION HISTORY 12

1.0 PURPOSE

The criteria were established to assure system planning continues to maintain reliability of the Bulk Electric System (BES) and does not adversely affect neighboring systems. Basin Electric Power Cooperative's (BEPC) local planning criteria is intended to ensure compliance with the mandatory reliability standards that are in place since the enactment of the Energy Policy Act of 2005. This local planning criteria is periodically reviewed and may be updated as appropriate to reflect changes in BEPC's operating and planning requirements and adhere with the WECC and MRO Standards.

2.0 SCOPE

BEPC's local planning criteria conforms to the NERC Reliability Standards, the MRO Standards and the WECC Standards, as appropriate. It is intended that this will provide an adequate level of service that is cost-effective, maintain service to firm loads, no overloads beyond the emergency rating will occur, and no cascading is allowed.

3.0 RESPONSIBILITIES

Manager Transmission Services:
Oversees the implementation of the transmission studies required to determine system performance in accordance with this criteria.

Planning Engineers:
These engineers perform the system studies, manage the power system modeling data, and recommend improvements and/or corrective actions to mitigate violations to this criteria.

Transmission Compliance division:
Responsible for providing insight on the regulatory requirements related to planning criteria. Also responsible for providing the regular reporting to the Regional Entities as required and determining issues of non-compliance.

4.0 APPLICABILITY

All transmission and generation Facilities identified as Bulk Electric System (BES) are applicable to this program. This includes but is not limited to the following Facilities:

- All Transmission Elements operated at 100 kV or higher and Real and Reactive Power resources connected at 100 kV or higher.
- Transformers with the primary terminal and at least one secondary terminal operated at 100 kV or higher.
- Generating resource(s) including the generator terminals through the high-side of the step-up transformer(s) connected at a voltage of 100 kV or above with:
    - Gross individual nameplate rating greater than 20 MVA.
    - Gross plant/facility aggregate nameplate rating greater than 75 MVA.
- Dispersed power producing resources that aggregate to a total capacity greater than 75 MVA (gross nameplate rating), and that are connected through a system designed primarily for delivering such capacity to a common point of connection at a voltage of 100 kV or above. Thus, the Facilities include:

- The individual resources, and
- The system designed primarily for delivering capacity from the point where those resources aggregate to greater than 75 MVA to a common point of connection at a voltage of 100 kV or above.

- Static or dynamic devices (excluding generators) dedicated to supplying or absorbing Reactive Power that are connected at 100 kV or higher, or through a dedicated transformer with a high-side voltage of 100 kV or higher, or through a transformer that is identified as BES.

5.0 DEFINITIONS

For purposes of this document, Basin Electric will use the following definitions:

Term (Acronym):	Definition:	Source:
Annual	Occurring within 12 months, but not to exceed 15 months.	BEPC Defined
Bulk Electric System (BES)	All Transmission Elements operated at 100 kV or higher and Real Power and Reactive Power resources connected at 100 kV or higher. This does not include facilities used in the local distribution of electric energy. **See NERCs Glossary of Terms Used in NERC Reliability Standards for Inclusions and Exclusions to the BES definition.*	NERC Glossary of Terms

6.0 SYSTEM PLANNING PERFORMANCE STANDARDS

BEPC conducts powerflow, stability, and short-circuit studies to evaluate system performance and reliability according to the following local criteria as well as applicable regional criteria. The initial transient period refers to the first 20 seconds after the contingency. The post-disturbance period refers to the period 20 seconds to 30 minutes after the contingency.

These criteria can be utilized as guidelines for real-time operations, however depending upon operating conditions, the real-time voltages may vary outside of the recommended ranges below and the owner of the facility should be contacted for guidance on the application of criteria during real-time operations.

6.1 Powerflow Studies (Steady State)

6.1.1 System Normal Conditions (No Contingency: Category P0)

6.1.1.1 Facility Loading Limits

Facility loading limits shall not exceed the continuous rating or the established equipment operating limits as defined in BEPC's Facility Ratings Methodology. The Facility Ratings Methodology shall be used to establish BEPC's facility ratings.

6.1.1.2 Voltage Limitations

Typically, transmission bus voltage levels will be maintained between 0.95 p.u. and 1.05 p.u. of nominal system voltage unless otherwise noted. All steady state BES voltages in the study base case shall meet these criteria after all documented system adjustments have been made.

Historical voltage levels will be maintained for new interconnections, unless the historical voltages are above 1.0 p,u,, then the new interconnection would be allowed to meet 1.0 p.u.

6.1.1.3 Reactive Power

Power factor criteria for customer loads must be maintained at 0.95 p.u. leading to 0.95 p.u. lagging. BEPC's transmission system reactive reserve capabilities will be adequate for the requirement of its transmission system and contract obligations to customers. Interchange of reactive power flow at the system interconnections with the customers and other utilities should be kept to a minimum, unless other conditions are agreed to as being mutually advantageous to both parties.

6.1.1.4 Switching Criteria

Switching of reactive control devices (i.e., reactor or capacitor bank) as a general rule, will not result in a bus voltage step-change of more than 0.03 p.u. System conditions and

configurations in certain areas may necessitate a somewhat altered criterion than noted here.

6.1.2 Post-Disturbance System

6.1.2.1 Facility Loading Limits

Facility loading limits shall not exceed the emergency rating or the established equipment operating limits as defined in BEPC's Facility Ratings Methodology. The Facility Ratings Methodology shall be used to establish BEPC's facility ratings.

6.1.2.2 Voltage Limitations

These criteria are intended to be applied to the post contingency conditions, prior to any operator intervention. Depending on the local transmission system characteristic, bus voltage levels are allowed to be between 0.90 p.u. and 1.10 p.u. of nominal system voltage for up to 30-minutes for planning and seasonal operating studies unless otherwise noted. Post-Contingency voltage deviations shall not exceed these limits.

6.1.2.3 Reactive Power Analysis

BEPC's transmission system shall be planned, designed and constructed to provide sufficient reactive capacity and voltage control facilities to satisfy reactive requirements. Reactive Power Margin analysis shall be performed when steady- state analyses indicate possible insufficient voltage stability margins. This can be assessed through a Power-Voltage (PV) and/or Reactive-Volt (QV) analysis. The voltage stability limits are defined based on a 5% margin from the nose point (or point before voltage collapse occurs).

6.1.3 System Adjustments

For all post-contingency event analysis, no system (operator initiated) adjustments other than automatic adjustments will be represented (no manual system adjustments such as capacitor, reactor switching, generator rescheduling, voltage regulator, or phase shifting transformer (PST) set point adjustments).

Manual system adjustments can be utilized for the post-recovery phase. These adjustments can include reactive device switching, adjustments of set points for load tap changing (LTC) transformers, adjustments of set points for phase shifting transformers, rescheduling of inter-area transfers, corrective sectionalizing on the high-voltage transmission system, and/or implementation of system operating guides.

With system adjustments, the loading on facilities and voltages must be reestablished to their continuous limits (provided in Section 2.1.1.1 and 2.1.1.2) within the allowed readjustment time period (post-recovery phase), generally 30- minutes following a contingency.

6.2 Short Circuit Evaluation

Short circuit studies are performed to determine whether circuit breakers have adequate interrupting capability for Faults that they will be expected to interrupt. Corrective Action Plans are developed for all instances where the maximum fault current a breaker is expected to interrupt exceeds 95% of its interrupting capability (short circuit rating).

Should a new interconnection result in affected facilities loading to 95% or greater of their interrupting capability, the interconnecting customer shall be responsible for all costs required to alleviate the issue as a condition of interconnection.

6.3 Stability Studies

Stability studies are performed by examining system performance following events to determine whether the BES meets the performance requirements in Table 1 of the NERC Reliability Standard TPL-001-4.

6.3.1 System Stability Evaluation

The system shall be designed to meet the performance requirements of NERC Reliability Standard TPL-001-4, Table 1.

If there is any instability associated with NERC Category P4 or P5 events, the area of instability should remain confined to a local area without jeopardizing the integrity of the BES or leading to cascading, voltage instability or uncontrolled separation (islanding).

High-speed automatic reclosure is not normally used on 500-kV and 345-kV lines. However, if reclosing is represented, the system must be able to withstand one unsuccessful reclosing. Normal total clearing times are 4-5 cycles for 230-kV, and 3-4 cycles for 345-kV and 500-kV breakers. These values include relay time, breaker time and one cycle margin. Backup clearing time after fault initiation for delayed clearing operations is normally 10 cycles plus normal clear time.

6.3.2 Transient Period Voltage Limitations

6.3.2.1 Voltage Response (Recovery)

For transient voltage response, the applicable criteria established by WECC and/or SPP shall be utilized to specify a low voltage level and a maximum length of time that transient voltages may remain below that level.

6.3.2.2 Overvoltage Criteria

BES transmission bus voltages should not rise above 1.20 p.u. at any bus in the system following fault clearing, unless affected transmission system elements are designed to handle the rise above 1.20 p.u.

Bus voltages in the BEPC transmission system are allowed to increase to 1.30 p.u. for a duration up to 200 msec. unless otherwise noted.

6.3.3 Transient Period Damping Criteria

All power oscillations must demonstrate positive damping within 20-seconds after the start of the studied event.

6.3.4 Generator Stability

All machines maintain synchronism as demonstrated by the relative rotor angles. For P1 planning events, no generating unit shall pull out of synchronism. In general, a generator is considered pulling out of synchronism if the rotor angle exceeds 180° from the system/area reference generator. A generator being disconnected from the Transmission System by fault clearing action or by a Special Protection System is not considered pulling out of synchronism (TPL-001-4 R4.1.1).

For planning events P2 through P7, if a generator pulls out of synchronism in the simulations, the resulting apparent impedance swings shall not result in the tripping of any Transmission System elements other than the generating unit and facilities directly connected to it (TPL-001-4 R4.3.1.3). If a generator pulls out of synchronism, an out-of-step check shall be performed to test if any cascading tripping would occur from the apparent impedance swings (TPL-001-4 R4.1.2).

6.4 Defining System Instability

6.4.1 Cascading

Cascading shall be identified in the steady-state simulation. This is determined by progressively greater instances of overloading. Transmission lines and transformers that are found to overload beyond their expected relay trip points and series capacitors that are found to overload to 100% of the 30-minute facility rating will be taken out of service and a new solution attempted. This process will be repeated until either no elements overload past their expected relay trip points or the process has been repeated at least three (3) times and continues to result in lines overloading past their expected relay trip points. Continuation of overloaded lines past three iterations shall indicate Cascading.

6.4.2 Voltage Instability

Voltage Instability shall be identified in both steady-state and transient analysis.

In the steady-state, for cases that converge post-contingency, loads at buses that fall below 0.70 p.u. will be considered to have tripped. Total load loss of greater than 1000 MW will be considered to be unstable. Cases that do not converge will be considered to be unstable.

In the transient simulation, load will be considered to have tripped at buses where the first post-recovery swing voltage dips below 0.70 p.u. Total load loss of greater than 1000 MW will be considered to be unstable.

6.4.3 Uncontrolled Islanding

Uncontrolled separation has occurred when the system as the result of dynamic instability breaks up into individual islands as the result of coherent clusters of buses loosing synchronism between each other. This is demonstrated by relative phase angle spread increasing beyond 180° among groups of buses across the system. To identify possible uncontrolled separation, high voltage buses (230 kV, 345 kV and 500 kV) will be checked for increasing angle spread across the system to monitor for islanding events.

6.5 Special Protection Systems (Remedial Action Schemes)

BEPC allows the use of Special Protection Systems to mitigate reliability concerns on a case-by-case basis.

7.0 REVIEW & APPROVAL INTERVALS

This document entitled "*Planning Criteria Document*" shall be updated, as necessary, by the Document Owner and any applicable Subject Matter Experts (SMEs). All updates to this document shall be Reviewed & Approved by the Document Owner at least every three years or more frequently as required. If no changes to the document have been identified within the three year approval cycle, then Basin Electric shall re-approve the current version as is.

8.0 DOCUMENT CONTROL

To maintain document integrity, all formatting changes to the document will be the responsibility of the Transmission Compliance division. The Document Owner and any applicable Subject Matter Experts (SMEs) shall make changes, additions and updates to the content of this document, and the Transmission Compliance division will provide a "Final" version of this document for review and approval by the Document Owner.

9.0 RETENTION PERIOD

This document and all associated documents will be retained in a secure repository for a minimum of ten (10) years.

10.0 REFERENCE DOCUMENTS

The following documents are referenced and may be considered as an extension of this document:

- Basin Electric's "*Reliability Standards Compliance Program*", Version 1.0, dated September 3, 2008.

REVISION HISTORY

CURRENT REVISION		
Date	Initials	Description
3/31/2016	JV	Created new template