DRAFT

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

FERC TIER Assessment) Docket No. RM06-16-000

COMMENTS OF
MIDWEST RELIABILITY ORGANIZATION STAKEHOLDERS

DRAFT

Midwest Reliability Organization ("MRO") Stakeholders respectfully submit comments on the Federal Electric Regulatory Commission ("Commission" or "FERC") Topological and Impedance Element Ranking (TIER) report that could significantly impact the basis and scope of Section 215 of the Federal Power Act, mandatory Reliability Standards.

I. INTRODUCTION

The Midwest Reliability Organization (or MRO) is one of eight Regional Entities that regularly provides industry stakeholder input into activities that impact North American Electric Reliability Corporation (NERC) compliance and the scope of NERC compliance under the Section 215 of the Federal Power Act.

II. COMMENTS

The MRO Stakeholders provides the following comments:

Summary

In general, the MRO Stakeholders support industry comments summarized by the Edison Electrical Institute (EEI), but offers the following more specific comments to the proposed Topological and Impedance Element Ranking (TIER) method. MRO Stakeholders are concerned that the TIER method may be potentially blind to voltage, Volt Amp Reactive (VAR), transient stability, and small signal stability as explained below. As such, the method may not correctly identify security based elements required to operate each of the interconnections in a secure state, nor will it correctly rank the security importance of Bulk Power System (BPS) elements.

The MRO Stakeholders note that the industry has already developed security tools such as steady state AC analyses, transient stability analyses, and small signal analyses. MRO Stakeholders recommend that the Commission analyze the existing tools, developed by the industry. MRO Stakeholders believe that these tools combined with NERC and regional oversight already identify and correct developing security issues such as Interconnected Reliability Operating Limits (IROLs).

MRO Stakeholders are also concerned that a BPS definition using the TIER approach will create a "floating" registry of those facilities and Registered Entities deemed within the BPS; thus, creating confusion in what is subject to reliability standards from one day to the next. This may lead to a dramatic expansion of the scope of Section 215 of the Federal Power Act which was intended to be Bulk Power System. The TIER method could easily include facility traditionally considered distribution facilities. MRO

Stakeholders recommend that the Commission use the existing industry transmission planning process and regional oversight already mandated through the existing NERC Reliability Standards and rules to determine entities and facilities within the BPS.

The MRO Stakeholders Supports EEI Comments

MRO Stakeholders support many of the industry comments summarized by the Edison Electrical Institute (EEI)[1]. A few of the more important EEI comments include: 1) the report does not adequately describe specifically what FERC believes is 'broken' and needs to be 'fixed', 2) the model does not establish a direct correlation between network congestion and instability, and 3) that the Commission should engage NERC and industry stakeholders to work collaboratively in defining practical solutions. If the objective of the TIER report was to define an algorithm that found and ranked reliability issues to avoid instability, cascading, and uncontrolled separation, the algorithm appears to be insufficient at this time. The TIER report should be a consideration in a joint effort between the Commission, NERC and industry to sharpen the objectives with an improved product to reduce the risk of a significant change in approach.

The TIER Method Has Significant Gaps as a Reliability Tool

The TIER method has significant gaps as a proper reliability tool because the method, in present form, is potentially blind to voltage instability, transient instability, and small signal instability.

[1] Docket # RM06-16-000.

The TIER method in its present form cannot properly identify potential voltage and VAR issues. The DC steady state power flow algorithm used by the TIER method is a simplified version of a full AC power flow and neglects voltage support and reactive power management.[2]

Because the TIER method is DC-based it would not correctly rank and would potentially ignore important semi-radial high voltage transmission facilities that supply critical voltage support to large lower voltage networks. An example discussed below demonstrates that transmission topologies exist that are susceptible to potential voltage collapse and that the TIER method could potentially miss identifying highlighting the risk or at a minimum wrongly ranking an important voltage support element because the TIER method is DC flow based.

A short 345 kV line feeding a 345/161 kV transformer without any other 345 kV support, for a large area, might be missed altogether as a potential voltage instability problem or at least ranked improperly. It is likely that a radial high voltage line or transformer connected to a lower voltage network would not react to changes in generation as the configuration could respond more to changes in load than in generation. This same configuration would likely contain higher network impedances due to the lower voltage network. Because of the configuration, the TIER method would not

[2] A DC powerflow is .... a simplification of a full AC power flow and looks only at active power flows, neglecting voltage support, reactive power management and transmission losses.

K. Purchala, L. Meeus, D. V. Dommelen, and R. Belmans, "Usefulness power flow analysis of dc power flow for active," in *Proc. IEEE Power Eng. Soc. Annu. Meeting 2005*, Jun. 2005, pp. 454–459.

highlight such an element as a risk as there would be relatively low flow change on the element. Further because of the same low flow change, the element would rank poorly in the TIER method even though the facility was a potential voltage collapse risk or at least important to area stability.

The TIER method in its present form cannot properly identify transient stability issues. The steady state power flow algorithm used by the TIER method does not contain the time based differential equations of a full dynamic simulation and cannot properly detect transient instability.[3]

This is demonstrated by the IEEE paper titled Definition and Classification of Power System Stability from the IEEE / CIGRE Joint Task Force on Stability, Terms and Definitions (IEEE Transactions on Power Systems, Vol. 19, No 2, May 2004)[4]. The paper, under section C, Analysis of Power System Security, states system security clearly highlights two aspects of its analysis, static security analysis and dynamic security analysis. Static security analysis is used "to verify no equipment ratings and voltage constraints are violated". Dynamic security analysis "involves examining different

[3] Power System and Control text book (Fouad and Anderson, Chapter 5 on Simulations of Synchronous Machines, page 150), "When the machine operates in a steady state condition, differential equations are not necessary. This means that steady state power flow algorithms do not contain the time differential equations that can predict transient stability issues.

[4]The above characterization of system security clearly highlights two aspects of its analysis:
Static security analysis – This involves steady-state analysis of post-disturbance system conditions to verify that no equipment ratings and voltage constraints are violated
Dynamic security analysis – This involves examining different categories of system stability described in Section III.

IEEE / CIGRE Joint Task Force on Stability and Terms and Definitions titled Definition and Classification of Power System Stability, IEEE Transactions on Power Systems, Vol. 19, No 2, May 2004

categories of system stability…" This stability group recognized the need for full dynamic simulations beyond steady state analyses to ensure system security. Therefore full dynamic stability analyses remain the benchmark[5] for verifying power flow simulation results and potential instability.

Many transient stability issues result from too much generation behind a high impedance path under contingencies. This TIER method which measures a change in element flow against a changed generation profile would seem to rank inversely and incorrectly from desired as higher impedance paths would rank lower in the power flow based method.

A reasonable transient or oscillatory stability example could be the loss of one or more extra high voltage outlet paths near a generation complex which could force too much generation onto a lower voltage network potentially resulting in transient instability. One possible TIER method outcome could be the steady state power flow based algorithm would accept of the total generation power without diverging and miss the transient stability issue altogether. Another possibility would be the incorrect ranking of the problem based on the higher impedance of the lower voltage network, which would likely rank poorly in a power flow based method.

For the same reasons stated above, the TIER method in its present form cannot properly identify oscillatory or small signal instability, since the steady state power flow

[5] Dynamic simulation is the benchmark for verifying power flow based simulation results. Dynamic simulation accurately includes the time dependent actions of control and protection.

algorithm used by the TIER method does not contain the time based differential equations of a full dynamic simulation. An example is the known Mid-Continent Area Power Pool (MAPP) quarter hertz mode. This documented phenomenon first appeared in the early 1970's with the addition of a 230kV interconnection between Manitoba and North Dakota in 1970. Low frequency oscillations were detected in the Dakotas and Canada, resulting in the isolation of North Dakota on several occasions through 1972.

The fundamental concept is of insufficient transmission strength. As additional transmission was constructed, DC controls tuned, and load developed, the quarter hertz mode was controlled. Similar to transient stability, one possible outcome is the steady state power flow based method would solve without diverging missing the oscillatory instability altogether. Another possibility would be the incorrect ranking of the problem as there would be no unusual impedance ranking indicators of insufficient transmission strength in a power flow based method. It is likely that those elements near or within the insufficient transmission area would rank lower than normal in the TIER ranking method as the fundamental condition would be of a weaker than normal transmission.

Due to the weaknesses identified above, the TIER method will not correctly identify security based elements required to operate each of the interconnections in a secure state, nor will it correctly rank the security importance of potential Bulk Power System (BPS) elements. As such, it is improperly suited to determine what should and should not be included in the BPS which defines the scope of applicable facilities for NERC standards.

Commission Should Use Existing Transmission Planning Processes

Existing NERC standards[6] on the transmission planning process already require steady state, transient, and small signal studies to be performed, that potential instabilities to be identified, that critical facilities be communicated to the regional authorities, and potential instabilities be corrected.

The existing NERC standards and methods are already superior to the TIER method since they already incorporate industry knowledge, industry methods, and proven technology to identify voltage instability, transient instability, and small signal instability.

The industry has been developing regional expertise pertaining to various regional instabilities for decades. An example, is the earlier mentioned MAPP quarter hertz mode where very few persons beyond local experts understand the complex nature of the DC controls used to enhance area damping. Proven transient and small signal analyses using known stability algorithms have been refined over time to ensure that model results match reality. Planning Coordinators, Transmission Planners, Reliability Coordinators, and Transmission Operators already exchange information on potential critical stability elements and conditions.

For the reasons mentioned above, the Commission should consider using existing regional practices and the NERC transmission planning standards combined with existing regional oversight as a viable and potentially superior method to the TIER method. Since the Commission has not clearly identified any final or ultimate objective there is no

[6]TPL-001, TPL-002, TPL-003, TPL-004, and FAC-014

reason to disqualify existing regional practices, NERC transmission planning standards, and existing regional criteria as viable alternatives.

Commission Should Allow Regional Flexibility

The existing NERC transmission planning process and regional oversight already provide a vehicle for FERC to determine at a minimum what should and should not be included in the BPS yet still allows regional flexibility. The regions should retain existing regional authority to add or exclude facilities to best meet regional needs.

Clearly, the electric grid is different in the eight Regional Entities, especially when it comes to system stability. Examples include the aforementioned MAPP quarter hertz mode and DC control schemes to damp such oscillations and the western part of the MRO region with long transmission lines to transport power from remote generation to load centers. Through NERC, Regional Entities have been developing methods to classify regional needs and the Commission should provide due consideration to the existing methods before a change is instituted.

III. CONCLUSION

The MRO Stakeholders respectfully requests that Commission provide due consideration to these comments.

Respectfully submitted,

Stakeholders of Midwest Reliability Organization

By_____

Dated: