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NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Unofficial Comment Form for Reliability-based Control – Project 2007-18

Please **DO NOT** use this form. Please use the electronic form located at the link below to submit comments on the proposal to use Area Control Error (ACE) Distribution Factors (ADFs) to address Purpose Statements B and D for Project 2007-18, Reliability-based Control. This proposal is designed to compliment the BAAL requirements currently under Field Trial. Comments must be submitted by **July 15, 2010.** If you have questions please contact Stephen Crutchfield at stephen.crutchfield@nerc.net or by telephone at 609-651-9455.

Background Information:

ACE limits to address transmission concerns

The Reliability-Based Control Standard Drafting Team (RBC SDT) seeks industry comments regarding a proposal to use Area Control Error (ACE) Distribution Factors (ADFs) to address Purpose Statements B and D from the Standards Authorization Request assigned to this drafting team.

Purpose Statements B and D capture industry comments relating to transmission issues associated with implementing a new frequency-based ACE limit to manage frequency – the frequency based limits are referred to as Balancing Authority ACE Limits (BAALs). These purpose statements follow:

SAR Purpose Statement B:

> *To support corrective action by the Balancing Authority when its excessive ACE, as determined by this standard, may be contributing to or causing action to be taken to correct a System Operating Limit or an Interconnection Reliability Operating Limit problem.*

SAR Purpose Statement D:

> *To support timely congestion relief by requiring the Balancing Authority to employ corrective load/generation management within a defined timeframe when participating in transmission loading relief procedures.*

This paper presents a proposal to address transmission flows caused by nonzero ACE as directed by these Purpose Statements. This proposal uses ADFs to limit effects of nonzero ACE on transmission flows through flowgates (paths) for which Transmission Distribution Factors (TDFs) are currently being calculated and used to address other transmission loading concerns.

For a more thorough examination of the technical merits of the ACE Distribution Factor methodology, please refer to the following white paper, *Calculating ACE Distribution Factors*, posted on the following page:

http://www.nerc.com/filez/standards/Reliability-Based_Control_Project_2007-18.html

Concepts

The *Calculating ACE Distribution Factors* paper describes a method to calculate ADFs using available TDFs. The RBC SDT proposes to augment the proposed BAAL with another ACE limit that will address transmission effects that may occur while meeting BAAL.

However, to understand this proposal, it is helpful to understand what it is not intended to address.

- This proposed Balancing Authority Transmission Limit would not apply to interconnections encompassed by a single Balancing Authority (BA) since there could not be unidentified interactions between BAs within such an interconnection.
- This proposal does not address transmission loading issues associated with transaction scheduling. Hence, this proposal does not address "loop flows."
- This proposal does not shift or remove the responsibility for correcting transmission loading from Transmission Operators and/or Reliability Coordinators.

This proposal uses the methodology in the white paper to calculate ADFs from known TDFs. However, Frequency Response for each BA is not, at this time, known with sufficient certainty. This proposal uses each Balancing Authority's Frequency Bias as a surrogate for its Frequency Response. At this time, Frequency Bias is not a reasonable substitute for Frequency Response since Frequency Bias is known to be much different than Frequency Response for many BAs. However, the industry recognizes the benefits associated with setting Frequency Bias to be reasonably representative of Frequency Response. Therefore, the drafting team proposes to address this issue nearer to implementation if it continues to be a concern.

Conceptually, this proposal bases calculation of BA Transmission Limits (BATLs) on the following:

- BATLs apply when flowgates (paths) experience congestion risk, and only during these situations. Said differently, if no flowgate (path) is experiencing congestion risk, a BA would not have to limit its ACE to remain within a BATL. As always, other requirements will apply and these may limit ACE.
    - Congestion risk occurs when a flowgate (path) experiences actual flows in a range from 90 – 100% of its present rating. While BATLs may be implemented in conjunction with other transmission loading relief efforts, BATLs are intended to limit actual flows caused by nonzero ACE that aggravate congestion on a flowgate (path) that is congested or sufficiently close to congestion.
    - In this proposal, Reliability Coordinators would make this determination.
- BATLs would be calculated in a central location and provided to Reliability Coordinators for distribution to applicable BAs. This provides uniform calculation of limits based on applicable flowgate (path) limits and using applicable TDFs. This minimizes market, Code of Conduct, computational accuracy, etc. issues.
- TDFs are typically associated with transactions. Therefore, TDFs tend to be calculated for a large number of sending and receiving "zones," and associated with flowgates (paths) of interest. Calculation of ADFs requires allocating BA Frequency Response into one or more of these zones. Frequency Response from multiple BAs can be added into one zone. Similarly, a BA may allocate Frequency Response into multiple zones, although benefits may not outweigh costs for any except very large BAs.
    - A BA that allocates its Frequency Response into multiple zones must provide a "pseudo-ACE" for each zone it uses.
    - NERC and/or the industry must provide oversight of allocation between zones to minimize opportunities for gaming.

  - Allocation of Frequency Response among zones does not increase computational burden from a practical perspective.

- The drafting team proposes calculating BATLs whenever a flowgate (path) limit changes and whenever TDFs update. However, beyond this, BATLs should be provided to BAs on a timing that coordinates with other transmission loading relief procedures presently used on the Eastern (mid-hour) and Western (next hour) Interconnections.
- BATLs are directional. This means that a positive, nonzero ACE may augment or negate congestion on a flowgate (path) of interest depending on the ADF and the direction of congestion on that flowgate (path).
  - Since actual flows reach or approach a flowgate's (path's) limit in one direction only, a BATL will impose a limit on ACE in either the positive or negative direction, not both. However, refer to "multiple flowgates (paths)" for a caveat.
- If multiple flowgates (paths) experience congestion risk during the same period, the most restrictive set of BATLs will apply to the BA.
  - This implies that BATLs may impose ACE limits in both directions simultaneously, albeit due to congestion risk on different flowgates (paths).
- A BATL uses ADFs to estimate the contribution to congestion on a flowgate (path) experiencing congestion risk. To estimate a limit for a BA, we must determine:
  - If the flowgate (path) is experiencing congestion risk.
  - The direction of congestion [that is: whether a positive or negative ACE contributes to congestion on that flowgate (path)].
  - The maximum contribution to congestion on a flowgate (this may be subject to application of a minimum ACE.)
  - Whether to specify a minimum ACE, in an absolute sense, beyond which we will not restrict the ACE of a BA even though its nonzero ACE causes flow in excess of the maximum contribution determined in the previous item. If a minimum ACE region is used, we must determine its size. (Note: if multiple BAs are in the same zone, this minimum ACE calculation will be calculated for each BA and/or partial BA separately. However, this adds little computational burden.)
- A BATL is calculated by taking the maximum contribution to congestion and dividing by the associated ADF for that BA and flowgate (path). We proposed that signs be selected to comport with TDF sign conventions.
  - If congestion occurs in the negative [flowgate (path)] direction, the sign of the BATL swaps.
  - If a minimum ACE is used, the BATL is modified if necessary to keep it out of the restricted region. For example: if minimum ACE of ± 100 MW is chosen and the unaltered BATL is calculated as -80 MW, then the BATL becomes -100 MW.
- The absolute value of a BATL should never be less than 1 MW and BATLs should be rounded up (in an absolute sense) to the next whole MW.

Experimental Results
A recent experiment with existing TDFs showed:

- The computational burden of calculating ADFs is trivial for modest laptop PCs, and would not impose significant computational burden on existing equipment.
- Frequency Bias is a technically justifiable method to calculate ADFs.
    - When Frequency Bias is used, entities using variable bias would need to provide their actual Frequency Bias to the central organization that calculates BATLs.
    - If Frequency Response is used, the central organization that calculates BATLs would need values for every zone associated with every BA.
- Use of this proposal provides a technically-based foundation for setting BA ACE limits for nonzero ACE that contributes to flows on flowgates (paths) experiencing congestion risk.
    - The drafting team recognizes that use of Frequency Bias instead of Frequency Response, placing a BA's Frequency Bias in one zone rather than distributing it among multiple zones, setting limits such as minimum ACE and others, ignoring AGC-effects that move units in multiple zones, etc. creates inaccuracies. However, the drafting team believes the proposal is a technically justifiable means to accomplish Purpose Statements B and D, in spite of these inaccuracies. Further, these parameters can be adjusted to enhance accuracy as more operating experience is achieved.
- Calculated BATLs appeared to be within appropriate ranges using 0.5% of flowgate (path) ratings.
- Setting a minimum ACE region at $-\pm L_{10}$ resulted in few BATLs being modified by this setting. As expected, BAs that affect flows significantly on a flowgate (path) benefit by application of minimum ACE regions while BATLs for other BAs are unaffected.

Proposal and Request for Comments
The RBC SDT proposes calculating BATLs at a central organization and providing these limits to BAs based on the following.

- A single-BA interconnection will not be required to use BATLs.
- Reliability Coordinators will determine when a flowgate (path) experiences congestion risk using wide-area views and analysis tools.
    - In addition to other monitoring, Reliability Coordinators monitor and respond to SOLs, IROLs, Transmission Loading Relief, etc. currently. Therefore, they are determining congestion risk currently.
- The maximum contribution to congestion for a flowgate (path) experiencing congestion risk should be a percentage of the applicable flowgate (path) limit. This will normalize contributions to flowgate (path) size.

  The drafting team proposes to set this maximum contribution at 0.5% of flowgate (path) limit in effect at the time of the calculation, rounded (half rounding) to the nearest MW, and never less than 1 MW.
    - This is based on the installed accuracy of metering as 0.5% approaches the measuring accuracy of most existing transmission equipment.

- The minimum ACE region, centered on 0, should be L_{10}. Note: this will not affect BAALs.
    - The drafting team considered several methodologies for setting a minimum limit and whether setting any minimum was appropriate. All methodologies seem arbitrary, although experience supports having a minimum to allow a BA sufficient "room" to regulate to meet typical variations in loads and resources.

      The present field trial waives CPS2 compliance for participants, and the drafting team believes the CPS2 requirement will be removed when it proposes (a) new Standard(s). Since CPS2 requires ACE to average L_{10} for only 90% of the fixed 10-minute periods in a month, it is difficult to provide a comparison for a minimum ACE region.

      However, a BA could be guaranteed to achieve 100% compliance with CPS2 if its ACE never exceeded L_{10} during a month. Therefore, considering BATLs will only be imposed when flowgates (paths) are experiencing congestion risk and in order to offer a bound comparable to present requirements, the drafting team suggests that the absolute value of a BATL should not become smaller than L_{10}.

      The drafting team welcomes technically-based proposals to replace or eliminate this minimum ACE.
- A BA should incur a violation if it exceeds a BATL for more than 15 consecutive minutes using 1-minute average data.
    - As presently proposed, a BA would incur a violation if it exceeded BAAL for more than 30 consecutive clock minutes using 1-minute average data. The BATL is proposed to address possible transmission issues associated with a BA operating with a nonzero ACE that is otherwise operating within applicable criteria.

      The drafting team considered a violation time interval from 1 to 30 minutes for BATLs. Considering many transmission rating issues must be resolved within 30 minutes, the drafting team proposes 15 minutes to provide time for Transmission Operators to take action if BA response to BATLs does not correct the transmission issue.

      As with DCS and assuming a flowgate (path) must be corrected within 30 minutes, 15 minutes provides each functional entity five minutes to analyze the situation and another ten minutes to effectuate actions to resolve concerns.
- Reliability Coordinators should calculate BATLs in conjunction with IDC (East) and WebSAS (West) update cycles and distribute BATLs each hour for flowgates (paths) experiencing congestion risk. BATLs should be updated whenever a flowgate (path) limit changes and/or TDFs change.

1. Do you agree with the 0.5% threshold as the maximum contribution to congestion for a flowgate (path) experiencing congestion risk? If not, please propose a technically-based method of calculating this threshold.

   ☒ Yes

   ☐ No

   Comments:

2. Do you agree with "L_{10}" concept that the absolute value of a BATL should not become smaller than L_{10} (a bound comparable to present requirements)? If not, please propose a technically-based method or elimination of "minimum ACE."

   ☐ Yes

   ☐ No

   Comments:

   Is staying with utilization of L_{10} as a "minimum ACE" in keeping with the intent to establish new, improved, methods of BA control?

3. Do you agree with allowing a BA to exceed a BATL for 15 consecutive minutes? If not, please propose a technically-based time limit for BATLs.

   ☒ Yes

   ☐ No

   Comments:

4. Do you agree with the proposed update rates, considering that BATLs will be imposed only during times of flowgate (path) congestion risk? {Every hour and every time a path limit changes (tied to the update cycle of IDC and WebSAS)} If not, please propose a technically-based update cycle for BATLs.

   ☒ Yes

   ☐ No

   Comments:

5. Do you have any other comment, not expressed in questions above, for the RBC SDT?

   Comments:

   A. Making adjustments to parameters "as more operating experience is achieved" would require a trial period.

   B. With respect to Reliability Coordinator involvement "minimizes market, code of conduct, computational accuracy, etc. issues", in the case of non-MISO market members, it is difficult to discern if information/changes are initiated by the MISO Reliability Coordinator or by the MISO Market Operator.

   C. More clarity is needed on how "zones" are defined.

   D. The first four questions assume we agree with the need for the proposal in the first place. It is our understanding that the need for this proposal was the belief that under the RBC standard, a BA could somehow foresee future frequency and would

choose to run continuously with a very large ACE counter to frequency and take no action. It is virtually impossible for a BA to have a large ACE and not impact frequency. It is generally irrational to operate counter to other Balancing Authorities (overgenerate during shortages or undergenerate during surpluses). I have heard of no cases of transmission issues due to the field trial. In addition, frequency control in the AGC window of time has improved in the past few years. The IROL standards provide transmission protection and we should not add unnecessary complexity.